

Confidential

Director's Room.



MINUTES OF THE PROCEEDINGS

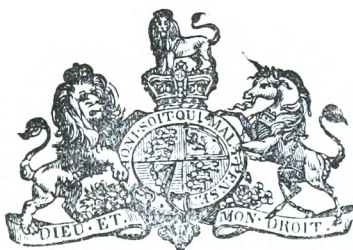
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OF THE

METEOROLOGICAL COMMITTEE,

1868.



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FOR HER MAJESTY'S STATIONERY OFFICE.

1869.

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ERRATA.

- Page 16. *For Rhpa read Rapa.*
„ 16. *For Glasgow read Grangemouth.*
„ 18. *For December 2nd read December quarter.*
„ 93. Letter from Board of Trade, *for 1868-9 read 1869-70.*

METEOROLOGICAL COMMITTEE.

2, Parliament Street, Monday, January 13, 1868.

PRESENT :

General Sabine in the Chair.

Dr. W. A. Miller.
Mr. Spottiswoode.

Captain Richards.
Colonel Smythe.

Mr. Gassiot.

The Director and the Secretary to the Committee were in attendance.

The Minutes of the last meeting were read and confirmed.

Mr. Scott submitted the following correspondence, which had been carried on with reference to the subject of giving warning of atmospherical disturbance to collieries :—

DEAR SIR,

Meteorological Office, December 19, 1867.

AT the last meeting of the Committee of this office the question of sending telegraphic notices of a serious barometrical depression to colliery proprietors was discussed.

One manager at Aberdare is in communication with me on the subject, but before applying formally to the Board of Trade for permission to send him such warning notices, I take the liberty, by General Sabine's advice, of asking you if you would kindly give me your opinion on the subject. The question is simply this.

Is benefit likely to arise from giving telegraphic intelligence of the approach of a barometrical minimum to collieries, so that fiery seams shall be worked with especial care until the disturbance of atmospherical equilibrium is to a great extent at an end?

If you could find time to answer this letter you would much oblige me, and I shall be able to get an independent opinion in case we bring the matter before the Board of Trade.

Professor John Phillips, F.R.S.,
Museum, Oxford.

Yours truly,
(Signed) ROBERT H. SCOTT.

MY DEAR SIR,

University Museum, Oxford, December 23, 1867.

YOUR note of December 19th has caused me much reflection. When, now 17 years ago, I was engaged as one of two commissioners, and reported to Parliament on Coal and Iron Mines (previous to, and in preparation for the appointment of inspectors) the question of the influence of varying barometrical pressure was much considered. In a general sense it was not doubted that, with a low barometer and more than usual warmth of underground current of air, the extrication of gas under pressure will be facilitated. But this applies, I think, chiefly to the innumerable small streams which come out of the fresh cuttings, and are swept away innocently by every good coal manager who uses air enough, *e. g.*, in Hetton Colliery 300,000 cubic feet of air passing every minute sweep off this gas regularly and easily. In a badly managed colliery, this momentary and continual efflux of gas constitutes a real danger; and, as far as I can learn, the collieries in South Wales generally want more air. Blowers which come off from fissures and faults are not to be overcome; and a good mine manager in a faulted district will take precautions, too serious to be lightly mentioned here. These blowers come off in general because they are *cut into*, and they are dangerous, because in bad management they are met by naked lights. Blowers and all other efflux of gas are safe with "Davy." There is an impression that the number of explosions is greatest, on the average, in autumn (late); this appears to me probable, but not certainly proved except in Northumberland and Durham (see my Report to Parliament), also that this depends on the low barometer and damp air of the moment; this I believe to be unproved, but very worthy of inquiry by statistics. There is a different explanation.

In a general sense I hold that by every means instruction should be given to managers and men; that the barometer, thermometer, and hygrometer should be regularly observed in every mine, and that it would tend to keep up attention to these matters if information of possible storm, or low pressure of unusual amount, were communicated to the managers. Unfortunately, we must not forget that the managers may come to attach too much importance to this one source of danger and trust too much to be warned of its expected arrival. On the whole, I am of opinion that it might be best, in the first instance at least, to send information of barometrical depressions to the *Inspectors*, and leave to them the responsibility of using it. This is my opinion—"Valeat quantum."

R. H. Scott, Esq.,
Meteorological Office.

Ever yours,
(Signed) JOHN PHILLIPS.

He had transmitted a copy of Professor Phillips' letter to the Board of Trade with the following letter :—

SIR,

Meteorological Office, December 28, 1867.

I HAVE the honour to inform you that an application has been made to this office for telegraphic information of sudden barometrical changes. The application has been made by Mr. W. Thomas,

manager of the Cwmaman Colliery near Aberdare. I have submitted the application to the Committee of this office, and have been directed by them to refer the matter to the Board of Trade. At times, suggestions as to the advisability of giving to collieries telegraphic warnings of the above nature have been made, as it is evident that any disturbance of the circulation of the atmosphere may affect the equilibrium of pressure underground, and consequently have an influence, more or less extensive, on the ventilation.

I have consulted Professor John Phillips, F.R.S., of Oxford, whose "Report on the Ventilation of Mines and Collieries" appeared in 1850, and I beg to enclose a copy of his reply to my letter. The case which was laid before him by me is this:—

"Is benefit likely to arise from giving telegraphic intelligence of the approach of a barometrical minimum to collieries, so that fiery seams should be worked with especial care until the disturbance of atmospherical equilibrium is to a great extent at an end?"

I may say that Mr. Thomas is at present keeping a barometrical register at the pits' mouth and underground, which he transmits regularly to this office. Lastly, I would venture to submit the following case for the consideration of the Board of Trade.

The two abnormal conditions of the atmosphere which would appear to have an effect on the ventilation of mines are a sudden great diminution of pressure, and great excess of pressure.

The action of the former is simple, as it facilitates the liberation of gas from the coal. As to the latter, the colliery explosion at Ferndale Colliery in the course of last month occurred when the pressure in the British Isles was very high and very uniform in amount, when winds were light, and fogs very prevalent.

I shall be happy, if necessary, to show you the weather maps of the dates in question, with the view of tracing, if possible, a connexion between the atmospherical conditions, which are admittedly beyond human control, and the causes which might have produced the explosion in question.

Telegraphic information of a sudden fall of the barometer could be sent from this office, whereas the converse conditions of a general stoppage of atmospherical circulation require generally a considerable time before they attain their full extent, and of these, therefore, telegraphic warning notices would not be of such importance. I beg accordingly to submit the foregoing to the consideration of the Board of Trade.

Thomas Gray, Esq.
Board of Trade.

I have the honour to be, &c.
(Signed) ROBERT H. SCOTT,
Director.

He reported that he had received a letter from the Board of Trade, stating that the matter had been referred to the Home Office.

Mr. Scott reported that the following places, having been approved by the Board of Trade, are now put on the list of stations to which telegraphic weather intelligence is forwarded, viz. :—

Leith,	Aberystwith,
Grimsby,	Carnarvon,
Goole,	Fleetwood,
Boston,	Morecambe ;
Hayle,	
and that, since the last meeting, applications for such notices had been received from	
Lynn,	Exeter (including Fremington),
Plymouth,	Queensferry,
Mostyn,	Glasgow,
Aberdeen,	Dundee,
Maryport,	Holyhead,
Exmouth,	Campbelton,
Teignmouth,	Jersey,
Broughty Ferry,	Sunderland,
Hull,	Newport (Mon.), and
Peterhead,	Girvan,
Barrow in Furness,	
and that arrangements respecting them are in progress.	

Mr. Scott gave a verbal report of his progress in procuring additional foreign telegrams. Six additional stations have been obtained, including Heart's Content.

Read—A letter from Mr. Meldrum asking for certain extracts of logs from the Indian Ocean, and stating that he would bear the expense of making those extracts.—Granted.

Read—A letter from Mr. Kerr regarding his progress at Valencia.

Read—A letter from Captain Maury asking for one of the copies of his works in the possession of this office.—Granted.

Resolved—That General Sabine, the Hydrographer, and Mr. Galton be a Sub-Committee to consider regarding the publication of the observations on temperature &c., mentioned in the Return printed in Minutes for 1867, p. 89.

Mr. Scott submitted a letter from Dr. Mann stating that with reference to the observations from Natal he merely wished a copy of them to be preserved in this office and that he did not ask the Committee to publish them. He also stated that he had found a letter from Admiral Fitz-Roy to Sir Thomas Maclear, being an advice of the intended transmission to him of the observations from the Cape of Good Hope. Mr. Scott was directed to forward them accordingly to Sir Thomas Maclear.

Read—A letter from Captain Toynbee, dated 30th December 1867.

Resolved—That the Secretary order an additional set of self-recording instruments.

The following cheques were drawn :—

	£	s.	d.
J. S. Harding, office petty expenses	-	-	25 0 0
P. Adie, instruments	-	-	30 2 6
Elliott Bros., do.	-	-	2 10 0
Rev. W. Sidgreaves (fittings), Stonyhurst	-	-	26 2 0
Professor Grant (fittings), Glasgow	-	-	130 1 0
J. H. Dallmeyer (lenses)	-	-	315 11 0
B. Stewart, stoneware dishes (Elliott & Son)	-	-	54 0 0
Do. water receptacles (Hayward, Tyler & Co.)	-	-	2 7 6
Do. chemicals and paper (Glasgow, Armagh, and Falmouth)	-	-	88 12 0
Total	-	-	<u>£674 6 0</u>

The Committee then adjourned until Monday, 27th inst., at 3 p.m.

METEOROLOGICAL COMMITTEE.

2, Parliament Street, Monday, January 27, 1868.

PRESENT :

General Sabine in the Chair.

Mr. De la Rue.

Mr. Spottiswoode.

Col. Smythe.

Mr. Gassiot.

Dr. W. A. Miller.

The Director and the Secretary to the Committee were in attendance.

The Minutes of the last meeting were read and confirmed.

Mr. Scott submitted the report of the Sub-Committee appointed at last meeting.

The Sub-Committee recommended the publication of the results prepared for the construction of wind charts for the North Atlantic in the form of tables, to contain only the observations taken from logs in this office. The Sea Temperature Results for the South Atlantic to be published, together with the results published by the Royal Meteorological Institute of the Netherlands, in the form of charts.

The data collected for the Pacific to be discussed and published in the parts of the ocean for which more than nine months data are in the office.

The Sub-Committee made no recommendation relative to the publication of the observations from land stations.—Report adopted.

Read—A correspondence connected with the Meteorological Society of Scotland.

Read—A letter from M. Leverrier to Mr. Scott asking for information regarding weather in the Atlantic for 1865 to aid in the preparation of his storm charts.

Resolved—That Mr. Scott be authorized to have a copy of the required extract made, and forwarded to M. Leverrier.

Read—A correspondence between Mr. Scott and the French Ministry of Marine regarding weather telegrams. Ordered, that same be printed (see page 7).

Read—A report from Captain Toynbee regarding the semaphore signal constructed by the Committee.

Mr. Scott submitted a drawing of the signal, and read a sketch, drawn up by Captain Toynbee, of instructions and explanations for those making use of the apparatus.

Resolved—That Mr. Scott be authorized to get the same printed, to be submitted to the Committee.

Mr. Scott reported that the following places, having been approved by the Board of Trade, have been added since the last meeting to the list of stations to which telegraphic weather intelligence is forwarded, viz. :

Girvan,
Holyhead,
Aberdeen,
Exmouth,
Maryport,
Teignmouth,
Lynn,
Queensferry,
Sunderland,

Glasgow,
Newport (Mon.)
Dundee,
Runcorn,
Jersey (St. Helier's),
Barrow-in-Furness,
Campbelton,
Mostyn,
Faversham ;

and that, since the last meeting, applications for such notices had been received from—

*Faversham,
Fisherrrow,
Banff, (including Portsoy,
Buckie, and Lossiemouth,
Inverness,

Grangemouth,
*Runcorn,
Anstruther,
Llanelly, and
Greenock,

and that arrangements respecting them are in progress ; those marked * already added to the list (see above).

Mr. Scott submitted a scheme which had been proposed by Mr. Gray and himself for testing weather warnings by comparing them with the storms actually experienced at the various ports to which these warnings are sent.

Read—Applications for Fishery Barometers from—

Wivenhoe.	Granted.
Port St. Mary (Man)	do.
Kinsale.	Declined.

Resolved—That the annual allowance to the Glasgow Observatory shall take date from 16th December 1867, and those to the observatories of Stonyhurst and Falmouth from 1st January 1868.

Resolved—That the various outlying observatories when once in action shall send curves and tabulations to the Central Observatory weekly, and that the Central Observatory shall send the same to the Central Office monthly.

The following cheques were drawn :—

For Salaries (January).

Mr. Scott	-	-	-	-	-	66	13	4
Dr. Stewart	-	-	-	-	-	33	6	8
Capt. Toynbee	-	-	-	-	-	29	3	4
Mr. Salmon	-	-	-	-	-	16	13	4
„ Harding, junr.	-	-	-	-	-	12	10	0
(a) „ Strachan	-	-	-	-	-	15	0	0
„ Gaster	-	-	-	-	-	8	6	8
(b) „ Harding, senr.	-	-	-	-	-	6	0	0
„ C. Harding	-	-	-	-	-	7	10	0
„ Curtis	-	-	-	-	-	6	10	0
(c) „ White	-	-	-	-	-	7	13	10
Rev. T. Kerr (Valencia)	-	-	-	-	-	20	16	8
Bills delivered—								
H. Smart, Liverpool agent	-	-	-	-	-	15	3	6
Negretti & Co., instruments	-	-	-	-	-	10	2	6
Davy & Sons, printing	-	-	-	-	-	79	16	6
E. Higgs, carpenter	-	-	-	-	-	6	19	0
L. P. Casella instruments	-	-	-	-	-	26	15	6
T. S. King, books	-	-	-	-	-	12	17	9
Messrs. Walker, charts	-	-	-	-	-	15	19	0
„ Beck, anemometers	-	-	-	-	-	151	10	0
						<u>£549</u>	<u>7</u>	<u>7</u>

(a) Extra allowance for charge of instruments included.

(b) (c) Calculated weekly.

The Committee then adjourned until Monday, Feb. 3, at 3 p.m.

Correspondence between Meteorological Office and Ministry of Marine, Paris, relative to Telegraphic Weather Information.

Meteorological Office, 2, Parliament Street,
January 4, 1868.

SIR,

I HAVE the honour to inform you that your letter to the Board of Trade on the subject of Circular No. 278 has been handed to me, with the request that I shall reply to it.

In the case of any future communication relative to the meteorological telegraphy between France and this country it will be sufficient if you address yourself to me, and complications will thus be avoided and everything will be simplified.

You do us the honour to ask for information relative to our proposed issue of weather intelligence.

I have been already in correspondence with M. Le Verrier, who has most liberally consented to send us four additional telegrams daily—Paris, Brussels, Strasburg, and Lyons—besides those which we now receive.

I believe that I am correct in supposing that Brest, L'Orient, and Rochefort are under your management, and that it is to you that I should address questions relative to them. Of this I am not quite certain, as I have been in correspondence with Capt. de Rostaing, and I should be much obliged if you would kindly inform me to whom I should apply for the information required.

As to our intelligence, I think that it would be most simple if we were to re-organize the service as it existed in the time of Admiral FitzRoy, viz., that we should transmit to the Minister of Marine in Paris a warning telegram whenever we thought it advisable to do so.

There is one request that I shall venture to make to you, sir, and I trust that you will be able to grant it. We intend to telegraph actual *facts*, not *prophecies*. Would it be possible for you to send me an extra telegram whenever a storm was felt on your coast? If you could do this we should be sure of getting the earliest possible intelligence of any storm which strikes the coasts of France, and we on our part would give you information of storms which strike our coasts. The proposed exchange of telegrams would thus be—

Meteorological Office to Ministry of Marine.

Daily abstract of report.

Occasional warning intelligence of storms.

Ministry of Marine to Meteorological Office.

Daily three stations.

Occasional warning intelligence of storms.

If you think that such a plan of exchange could be effectually carried out I shall be very happy to bring the subject before the Meteorological Committee at their next meeting. If you wish for any further information I shall be most happy to afford it.

I am, &c.,

M. E. Mouchez,
Capitaine de Frégate, &c. &c., Paris.
Ministère de la Marine.

ROBERT H. SCOTT,
Director.

MONSIEUR,

Paris, Jan. 14 /68.

AVANT de répondre aux diverses questions posées dans la lettre que vous avez bien voulu adresser au Capitaine Mouchez, je crois utile de vous faire connaître les changements survenus dans notre service.

En 1863 cet officier avait été chargé d'organiser l'échange des télégrammes météorologiques sur nos côtes, et c'est d'après les indications et les conseils de l'Amiral FitzRoy, auquel il s'était adressé, que fut installé le service météorologique de nos ports.

En 1865 M. Mouchez était remplacé par le Capt. de Rostaing, auquel j'ai succédé il y a peu de temps. C'est à cette désignation que je dois l'honneur de vous écrire aujourd'hui.

Les Travaux de l'Observatoire, sous la direction de M. Le Verrier, n'ayant pas encore donné de résultats de prévision satisfaisants, le Ministre de la Marine croit devoir conserver son *service pratique spécial*, organisé dans le bureau des télégraphes du

Ministère, où nous ne faisons que *transmettre l'état actuel du temps*. Je crois, comme vous, que c'est encore ce qu'il y a de mieux à faire aujourd'hui, jusqu'à ce que les études scientifiques permettent de donner les prophéties, avec quelques chances de certitude.

Nous échangerons donc avec le bureau météorologique du *Board of Trade* les télégrammes suivants :

1°. Tous les matins à 9h. le temps des ports désignés.

2°. *Occasionnellement* : L'annonce des mauvais temps qui arriveront sur un point quelconque des côtes de France et d'Angleterre.

Les télégrammes envoyés de Londres seront adressés au Ministère de la Marine à Paris.

Les télégrammes envoyés de France à Londres partiront directement des ports désignés, par le *Board of Trade*, sans passer par le Ministère afin de ne pas perdre de temps.

C'est ainsi que cela avait été réglé avec l'Amiral FitzRoy.

Vous jugerez, sans doute, convenable de conserver les mêmes groupes de chiffres, expliqués dans le *Weather Book*.

Les ports de Brest, L'Orient et Rochefort envoyaient à l'Amiral FitzRoy, l'état du temps ; les recevez-vous encore ? et vous suffisent-ils ? Vous pourrez nous demander les ports qui vous conviendront le mieux.

Lorsqu'à un moment quelconque de la journée il vous conviendra de connaître le temps sur un des points de nos côtes, vous pourrez le faire demander au Ministère de la Marine ; on vous répondra de suite. Notre bureau télégraphique du Ministère, fonctionnant continuellement, jour et nuit.

Comme il pourrait y avoir doute sur le moment où commence le *mauvais temps*, je pense qu'il serait utile de déterminer d'avance, le chiffre de l'échelle du vent et celui de la descente du baromètre, à partir duquel on devra considérer le *temps comme mauvais*, et par suite envoyer un télégramme d'avertissement. Ce serait le meilleur moyen de fixer l'opinion des employés des ports chargés de la service et d'éviter des malentendus. Je laisse cette question entièrement à votre appréciation. Il est bien entendu aussi que vos télégrammes sont en mesures Anglaises et les nôtres en mesures métriques ; c'est du reste ne rien changer à ce qui s'est fait jusqu'ici.

Pour éviter des doubles envois de télégrammes que vous auriez à faire à M. Le Verrier et au Ministre de la Marine, vous n'aurez qu'à mettre la *double adresse* sur ceux que vous envoyez aujourd'hui à M. Le Verrier et qui seraient également utiles à la Marine.

Si vous le jugez bon, le commencement de ce service, ainsi réglé, pourrait être fixé au 1er Février ; vous auriez le temps, d'ici là, de me désigner les ports dont vous desirez connaître l'état du temps, et moi d'aviser les mêmes ports qu'ils aient à vous adresser les télégrammes quotidiens et accidentels.

Je suis, &c.

A. ROUBET

Capitaine de Frégate,
Chargé du Service, &c.

A M. le Directeur des Services Météorologiques
à Londres.

SIR,

Meteorological Office, January 22, 1868.

WITH reference to your letter of the 14th inst., I have to express to you the sincere satisfaction of this Committee at your assurance that your department will co-operate with this office so cordially.

I do not think that we can do better than adopt exactly the plan which was suggested by me and is contained in your letter. We shall, of course, keep to the system of telegraphy designed by Admiral FitzRoy, as regards the significance of the different figures employed. We receive, as you say, Brest, L'Orient, and Rochefort daily. I do not like to ask for any more stations, as I should wish to return to you something in the way of information in exchange for the additional intelligence you might send.

I need scarcely say how valuable additional information would be to us, if you were willing to increase the number of coast stations which at present report to us. If you are disposed to grant us this I shall be most happy on my part to supply you, if necessary, with additional reports from our stations.

With reference to the occasional telegraphic notice of storms, what I would suggest to you, sir, is the following. Whenever the Ministry of Marine receives intelligence of the existence of a storm on any part of the coasts of France, it would be very valuable to us if you could at once telegraph this fact to me. In addition, if any of your observers

at any station observes that his barometer is falling at the rate of 2 millimètres per hour or that the wind force has reached the figure 8 of our scale, we should be glad to receive this information.

Yesterday afternoon I telegraphed to you in consequence solely of the rapid descent at Valencia.

Lastly, I have to request that you will be so kind as to tell me which messages you wish to receive. As soon as I learn this I shall have the two addresses placed on the messages. I shall write to-morrow about some matters connected with the three stations which now report to us.

M. A. Roubet,
Capitaine de Frégate.

I am, &c.,
ROBERT H. SCOTT.

Ministère de la Marine,
Paris, le 24 Janvier 1868.

Bureau Météorologique.

MONSIEUR,

J'AI l'honneur de vous accuser réception de vos lettres des 18, 22, et 23 de ce mois, et de vous annoncer que les ports de Brest, L'Orient, et Rochefort continueront l'envoi journalier de l'état du temps, et que les ports des côtes occidentales de France, Brest, L'Orient, Palais, St. Nazaire, Rochefort, et Royan, vont recevoir l'ordre de vous envoyer *directement*, à partir du 1 Février prochain et occasionnellement :

1°. Un télégramme annonçant les oscillations du baromètre, lorsqu'il baissera de 2 millimètres et plus, en une heure.

2°. Un télégramme annonçant la force du vent lorsqu'elle atteindra le chiffre 8 de votre échelle, 7 de l'échelle française.

3°. Enfin un télégramme annonçant les mauvais temps ou orages qui éclateraient subitement sur chacun de ces points.

Nos côtes de la Manche étant très voisines des côtes anglaises, nous pensons qu'il n'est pas utile, pour nos ports, sur cette mer, de vous envoyer les télégrammes de mauvais temps. Si cependant vous le desirez, on vous les enverra.

Nous sommes tout disposés à vous envoyer des télégrammes des ports des côtes de France que vous désignerez, sans réclames, pour nous, d'autres avis que ceux que vous envoyez actuellement.

Quant à nous, en dehors des télégrammes journaliers que vous nous envoyez, nous n'avons besoin de recevoir, pour le moment, que le télégramme des mauvais temps sur les côtes d'Angleterre.

* * * * *

M. le Directeur du Service Météorologique
à Londres.

Je suis, &c.
(Sd.) A. ROUBET.

MY DEAR SIR,

Meteorological Office, January 29, 1868.

I SINCERELY regret that great pressure of business has prevented my replying sooner to your letter of the 24th inst.

I am desired by the committee of this office to thank you for having made the arrangements by which your ports on the west coast of France will send us news of bad weather. As to the channel coast I agree with you that it is not necessary to receive intelligence from the ports on it, as they are so near our own frontier. I have, therefore, no suggestions to add on this subject.

As regards the additional information which you so liberally offer to send us, I venture to ask if you could send us daily reports similar to those now sent from Brest or from the ports of *Boulogne*, *Bayonne*, and either *Toulon* or *Marseilles*, whichever of these two you prefer.

We have no station in the S.E., as Dover is very near London, and has, therefore, been disused, and therefore we wish for Boulogne, being at a greater distance.

Bayonne and some port in the Gulf of Lyons would be most valuable additions to our system. In addition to this I scarcely know if I might venture to ask for a daily 2 p.m. report from Rochefort. We receive afternoon reports from several of our own stations, as we find them of great value in tracing the changes from day to day.

I feel, sir, that I have taken a great liberty, I hope not too great, in asking for so much, but your kindness has induced me to take such an opportunity.

I can only say that although you do not at present require more information than what we send you it will always be in your power to obtain, by simply asking for it, any of the reports from our stations.

I cannot conclude without again assuring you of the great pleasure which it has afforded this committee to learn that the Ministry of Marine is so ready to co-operate with them in endeavouring to put this branch of the science of Meteorology on a sound basis.

I am, &c.,

Capt. A. Roubet, Ministry of Marine, Paris.

ROBERT H. SCOTT.

Ministère de la Marine,
3 Février 1868.

MONSIEUR,

J'AI l'honneur de vous informer qu'ayant été appelé à remplacer M. le Capitaine de Frégate Roubet, je me tiens entièrement à votre disposition pour tous les renseignements et toutes les communications qui ont trait au service météorologique.

Je viens de prendre le service, et je vous demanderai la permission de prendre des informations touchant les questions passées dans votre lettre du 23 Janvier.

Soyez assuré que je ferai tous mes efforts pour que les renseignements que vous demandez vous parviennent des différents ports que vous indiquez.

Je vais faire demander officiellement l'autorisation de l'envoi des dépêches directes des ports que vous indiquez, car il faut que le Ministère adresse cette demande à la Direction des Télégraphes, qui est un service à part.

M. le Commandant Roubet a bien voulu me donner des explications, mais je vous serais particulièrement obligé de me tracer dans un tableau une liste des renseignements dont vous pouvez avoir besoin, et les ports dont la situation vous paraît le plus convenable pour ce genre de renseignements.

Je vous demande pardon de vous donner cette peine, mais comprenant l'importance de l'exactitude des indications pour un travail comme le vôtre, je désire pouvoir donner aux différentes personnes chargées de ces communications des renseignements bien précis sur ce que vous désirez connaître.

Tout en vous demandant ces renseignements je vais prendre des mesures pour que vous puissiez avoir sans retard, aussitôt que votre lettre me sera parvenue, les documents que vous demandez.

Veillez me croire, Monsieur, tout à votre service,

V. VÉRON,

Lieut. de Vaisseau
au Ministère de la Marine,
(Service Météorologique.)

Mr. Scott,
Meteorological Office.

Meteorological Office,
February 6, 1868.

SIR,

WITH reference to your letter of the 3rd inst., I shall be very happy to give you any explanation which you may require, but before doing so I should be glad to learn whether you have got all my letters to Capts. Mouchez and Roubet. They are dated respectively January 22, 23, 29. I do not know that I can put the matter more clearly before you than I have done in those letters. If you wish for a recapitulation of their substance, I shall be most happy to give it to you, but at present I do not quite understand what it is that you wish to learn.

If you will kindly let me know what I am to do, I shall at once proceed to carry it out.

I have, &c.

(Signed) ROBERT H. SCOTT.
Director.

M. le Lieut. V. Véron,
Ministère de la Marine, Paris.

Ministère de la Marine,
Paris, 8 Février 1868.

MONSIEUR,

JE REGRETTE de ne pas m'être expliqué plus clairement dans la lettre que j'ai eu l'honneur de vous écrire. J'espère être plus heureux cette fois-ci, monsieur, et pouvoir

vous donner d'une manière certaine des renseignements intéressant le service météorologique.

Je suis chargé au Ministère de la Marine du service qui regarde le code international de signaux et les sémaphores.

Ces sémaphores, en nombre de 134, sont placés à très petite distance les uns des autres. Ils ont à l'intérieur un appareil télégraphique électrique pour transmettre les dépêches maritimes.

Les guetteurs chargés des signaux sont aussi chargés de l'appareil électrique, et pour ce service, dépendant de l'administration des télégraphes, ces guetteurs ont des instruments pour faire des observations, et envoient déjà tous les jours des renseignements météorologiques aux préfets maritimes.

Lorsque l'on m'a appelé à remplacer Monsieur le Capitaine Roubet, appelé à d'autres fonctions, j'ai dû cette faveur à la position que j'occupe dans la Commission des sémaphores. J'ai pensé que vous ne teniez pas à avoir des renseignements donnés par un agent plutôt que par un autre.

J'ai vu que les capitaines de port n'étaient pas au courant du service qu'on leur demandait, et pouvaient ne pas s'y prêter volontiers, prétextant que leur service ne leur permettait pas toujours d'aller jusqu'au bureau télégraphique souvent éloigné.

De son côté, l'administration des télégraphes ne pouvait qu'accepter avec plaisir la proposition que je lui faisais faire, puisqu'elle diminuait le nombre de ses agents employés.

Enfin je pensais que des renseignements partis de la côte même pourraient vous être plus utiles que ceux de l'intérieur, comme Rochefort, par exemple, qui ne peut pas vous donner l'état de la mer à moins de la demander à un des sémaphores.

Voici, donc, ce que j'ai fait. J'ai désigné des sémaphores placés aussi près que possible des points que vous avez indiqués. J'ai demandé au directeur des télégraphes la franchise des dépêches pour les sémaphores suivantes :—

Cap Grisnez.

Pointe d'Alprecht.

Cap la Hague.

St. Mathieu.

Penmarch.

Ile de Groix.

Belle Ile.

Pointe de Chemoulin.

Ile d'Aix.

Pointe de Graves.

Biarritz.

Cap Béarn. }

Cap Sicié. }

Nice. }

Méditerranée.

Les cartes qui accompagnent mon envoi vous indiqueront la position de ces postes qui sont beaucoup plus nombreux que vous ne l'aviez demandé, mais dans le cas où on aurait voulu plus tard étendre les relations, j'ai préféré faire la demande de suite.

Comme il faut un certain temps avant que les ordres donnés puissent être bien compris et bien exécutés, il n'y aura rien de changé, jusqu'à nouvel ordre, aux renseignements qui vous parviennent depuis longtemps des ports.

Avec les cartes vous trouverez une instruction sur le service sémaphorique, contenant l'article qui a rapport au service météorologique. Veuillez offrir le tout au Meteorological Office.

Lorsque ce service sera installé, je suis convaincu, monsieur, qu'il marchera régulièrement, et qu'il ne présentera aucune difficulté. J'ai marqué au crayon rouge les sémaphores dont les noms sont inscrits plus haut.

J'ai l'honneur, &c.,

(Signé)

V. VÉRON.

M. R. H. Scott.

Meteorological Office.

Si vous désiriez supprimer la correspondance de quelque sémaphore, veuillez me l'indiquer. Veuillez me faire connaître l'heure à la quelle vous désirez que les sémaphores vous envoient les bulletins réguliers.

Meteorological Office,

February 18, 1868.

SIR,

I have the honour to acknowledge the receipt of your letter of the 8th inst., and to thank you for the charts and instructions which accompanied it, which I have presented in your name to the Committee.

It is, as you suppose, a matter of minor importance to us by what officer observations are taken, provided that their accuracy be guaranteed.

It would, therefore, be most necessary for us that the daily reports which are sent to this office should consist of five or six groups of five figures each, as is the case with those sent at present from Brest, &c., and that the corrections for the respective instruments should be supplied to us.

If I am correct in my view of your letter, I conceive that you propose that Brest, L'Orient, and Rochefort should cease to telegraph to us, and that reports from the semaphore stations named by you should be substituted for them. You are so kind as to suggest the names of 14 stations; I am extremely obliged to you for this proposal, but would suggest that only six of these stations should telegraph to us daily, viz. :—

Cape Gris Nez.

St. Mathieu, instead of Brest.

Ile de Groix, „ L'Orient.

Ile d'Aix, „ Rochefort.

Biarritz.

Cape Sicié.

In addition, I would request that these stations, and the others which you have named, should send an occasional message whenever the barometer falls 2 mm. per hour, or the wind force reaches 7 of the French scale, as proposed by Captain Roubet in his letter of January 24.

If in addition I might venture to ask for a 2 P.M. report daily from Ile d'Aix it would be of the greatest possible value to us.

In order that daily messages should reach us in time, they should be dispatched from the stations at 8 A.M.

Hoping that I have conceived your meaning correctly, I have the honour to remain,

Your obedient servant,
(Signed) ROBERT H. SCOTT.

M. le Lieut. Véron,
Ministère de la Marine, Paris.

MONSIEUR,

25 Février 1868.

J'ai l'honneur de vous informer que le Ministre de la Marine a écrit à son collègue de l'intérieur pour lui demander l'autorisation d'expédier des dépêches directes de nos sémaphores à Londres.

Aussitôt que la réponse sera parvenue, j'enverrai aux guetteurs une instruction qui leur permettra de composer leurs télégrammes de la même manière que ceux que vous recevez déjà.

Ils seront composés de six groupes, et je copie exactement le tableau que l'on a suivi jusqu'à ce jour.

Lorsque nos guetteurs auront appris à composer ce télégramme, ils pourront commencer leurs envois; cependant quelques groupes, dans les commencements, seront représentés par des "0," car je dois aller moi-même faire établir les instruments que nous envoyons pour compléter la série, et cela demandera un peu de temps.

Aussitôt que vos premières dépêches seront parvenues dans de bonnes conditions, celles de Brest, L'Orient, et Rochefort cesseront, étant remplacées par celles de St. Mathieu, Ile de Groix, et Ile d'Aix.

M. Robert H. Scott,
Meteorological Office.

J'ai l'honneur, &c.

V. VÉRON.

METEOROLOGICAL COMMITTEE.

2, Parliament Street, Monday, February 3, 1868.

PRESENT :

General Sabine in the Chair.

Mr. De la Rue.
Captain Richards.
Mr. Galton.

Mr. Gassiot.
Dr. W. A. Miller.
Mr. Spottiswoode.

The Director and the Secretary to the Committee were in attendance.

The Minutes of the last meeting were read and confirmed.

Mr. Scott having reported that he understood the Board of Trade intended to vacate their present premises, 2, Parliament Street ;

Resolved—That he be directed to apply to the Board of Trade as to the locality for this Office for the next financial year.

Mr. Scott reported that he was in communication with the Trinity House and with Liverpool regarding Semaphores.

Read—A letter from the Home Office to the Board of Trade, declining to take any steps with regard to sending information of meteorological disturbances to collieries.

Read—An application asking the Office to exhibit at the International Maritime Exhibition in Havre, in 1868.

Resolved—That a set of the instruments supplied to vessels, and of the instructions for using these, be sent, and also a model of a semaphore.

Read—A letter from the Secretary of the African Steam Ship Company, offering to collect observations from that part of the Atlantic through which their steamers sail.

Offer accepted.

Read—A letter from Captain Inglis to Captain Toynbee regarding sea temperature at the Banks of Newfoundland.

Read—A suggestion from Captain Toynbee regarding Variation Charts.

Resolved—That Mr. Scott be requested to ask if Captain Richards could have 1,000 copies printed, reduced size.

The Committee then adjourned until Monday, 10th February, at 3 p.m.

METEOROLOGICAL COMMITTEE.

2, *Parliament Street*, Monday, February 10, 1868.

PRESENT :

General Sabine in the Chair.

Mr. Gassiot.

|

Col. Smythe.

The Director and the Secretary to the Committee were in attendance.

The Minutes of the last meeting were read and confirmed.

Mr. Scott reported that Captain Toynbee and himself had gone to Blackwall with Captain Nisbet and chosen a site for the two semaphores that are to be erected there by the Trinity Board.

Mr. Scott submitted a lithographed explanation of semaphores.

Resolved—That this explanation be printed and attached to the Minutes.

Mr. Scott presented proof of a chart of the temperatures in the South Atlantic for the month of January drawn up as desired by the Committee.—Chart approved.

Mr. Scott gave a verbal account of the progress of the office in preparing Ocean Charts for publication.

Mr. Scott presented printed proofs of certain proposed publications by Admiral FitzRoy of extracts from logs, but which were afterwards suppressed, being Nos. 15, 16, 17 of Meteorological Papers.

Resolved—That these be preserved for reference in this office.

The Committee then adjourned until Monday, 17th February, at 3 p.m.

METEOROLOGICAL COMMITTEE.

2, Parliament Street, Monday, February 17, 1868.

PRESENT :

General Sabine in the Chair.

Mr. Galton.
Dr. W. A. Miller.
The Hydrographer.

Col. Smythe.
Mr. Spottiswoode.
Mr. Gassiot.

The Director and the Secretary to the Committee were in attendance.

The Minutes of the last meeting were read and confirmed.

Read—The following correspondence with the Board of Trade regarding house accommodation for the Meteorological Office.

SIR, Meteorological Office, February 4, 1868.
I AM directed by the Committee of this Office to inquire from you whether there is any possibility of their being called on to vacate their present office in the course of this year, and if so, whether any provision can be made by the Board of Trade for their accommodation.

Thomas Gray, Esq.,
Board of Trade.

I am, &c.,
(Signed) ROBERT H. SCOTT,
Director.

M 1515.

SIR, Board of Trade, Whitehall, February 12, 1868.
I AM directed by the Board of Trade to acknowledge the receipt of your letter of the 4th instant requesting to be informed whether there is any possibility of your being called upon to vacate your present offices during the year, and if so whether any provisions can be made by them for your accommodation.

In reply I am to state for the information of the Meteorological Committee that this Board are unable, from want of information on the subject, to give any reply to the first of these queries.

As regards the second, I am to state that this Board are not in a position to accept any responsibility or to offer any advice with respect to the arrangements that may have to be made for the future housing and furnishing of the Meteorological Office.

R. H. Scott, Esq.,
Meteorological Office.

I am, &c.,
(Signed) THOMAS GRAY.

Read—The following report of Captain Toynbee to Mr. Scott, regarding his recent visit to Liverpool.

R. H. Scott, Esq.

SIR, 2, Parliament Street, February 14, 1868.
I BEG to report for the information of the Committee that I visited Liverpool on the 12th instant, by appointment, with Messrs. Lamport and Holt, that I might see the commanders of their steamers trading to the Brazils, and explain the meteorological instruments to them with which they were about to be supplied. Three commanders were present, and seemed to take an interest in the work, especially Captain Stratford Lecky, R.N.R., of the S. S. Uruguay, who has for many years taken similar observations for the purposes of navigation. They all promised to help us. I especially called their attention to the importance of our having *reliable* observations, however few in number, telling them that my greatest trouble in going through the logs is that so many seemed to be "*cooked*."

I also called upon Messrs. Fletcher and Parr, agents for the steamers to the West coast of Africa, with a letter of introduction from Mr. Duncan Campbell, Secretary to the Company, and saw two of their commanders, who promised to take the necessary observations for us. By the advice of Mr. Campbell I am waiting until the Commodore returns to England before supplying that company, as he is said to be particularly fond of meteorology, and is likely to enter thoroughly into the work. Mr. Campbell tells me that on his return he must come to London, and then he will bring him to call upon me at my office.

I called upon Mr. Harris, manager of the Inman line, who is kindly sending out instruments to Halifax, N. S., for us, under the special care of one of their commanders. He told me that as the boxes were small, and they were for the public service, the company would not charge any freight upon them.

I have also seen Captain Inglis, the marine superintendent for Cunard's Line, who told me that some of their commanders were taking great interest in the work, and he thought that he should soon send us some very satisfactory logs.

Perhaps I may be allowed to suggest for the consideration of the Committee the expediency of resuming the practice of giving prizes for the best logs, and publishing lists of those who keep them, classed according to their merit. Having had a gold watch and Dollond's telescope given to myself, I speak from experience when I say that the practice has a beneficial effect.

Yours, &c.,

HENRY TOYNBEE.

Mr. Scott reported that since the meeting of the 27th January last, applications for telegraphic Weather Intelligence have been received from the following places :—

Porthcawl,
Cowes,
Youghal,
Yarmouth,

Burnham,
Granton,
Middlesboro,
Tynemouth, and
Montrose ;

and also that the following places, having been approved by the Board of Trade, have been placed on the list of stations warned since the same date :—

Peterhead,
Barnstaple,
Ilfracombe,
Anstruther,
Fisherrow,
Greenock,
Banff,
Liverpool,
Burnham,

Llanelly,
Instow,
Fremington,
Inverness.
Porthcawl,
Glasgow,
Burghead,
Cowes,
Granton.

Resolved—That Mr. Scott be authorized to employ a Commissionaire as messenger.

Mr. Scott mentioned that Captain Vine Hall had offered to have observations made at e Rūpa or Oparo, the coaling station of the New Zealand and Panama Company in the South Pacific.—Offer accepted.

Mr. Scott requested permission to prepare a card explanatory of the Drum Signal, and containing some intelligence respecting weather, to be framed and hung up at each place where the signal is exhibited, in accordance with the former practice of the office.

He was directed to submit a copy of such a card to the Committee at their next meeting.

The Committee then adjourned until Monday, 24th February, at 3 p.m.

METEOROLOGICAL COMMITTEE.

2, Parliament Street, Monday, February 24, 1868.

PRESENT :

General Sabine in the Chair.

Mr. Gassiot.

Colonel Smythe.

The Director and the Secretary to the Committee were in attendance.

The Minutes of the last meeting were read and confirmed.

Mr. Scott presented a printed proof of the explanation of the semaphore signal.—
Approved (1,000 copies to be ordered).

Mr. Scott presented the following memorandum as to the possibility of using the semaphores for daily weather :—

INASMUCH as it may be of importance to certain ports to get *daily* information from adjacent stations of their *winds* at 8 a.m., whether their force amounts to a gale or not, it has been suggested that daily telegrams of the winds at such stations should be sent to these ports direct from the respective telegraph offices, the authorities at each port to bear half the cost of transmitting this information.

Thus, for instance, London might receive daily reports from Yarmouth and Penzance; and Liverpool those from Greencastle and Cape Clear.

This information might be made public each day as soon as received (say about 10 a.m.) by means of two wind semaphores.

The examination of the weather reports from most stations is finished between 11 a.m. and noon; if this shows that a gale is blowing which (in the opinion of the office) is of more importance to a port than the winds of its adjacent stations, a telegram from this office could be sent to the keeper of the semaphores to exhibit such a gale on one of the semaphores; this change would take place about noon.

To effect this double use of the wind semaphore the following changes would be required :—

A semaphore *without any distinguishing mark* would be used for winds of a force below 8, which are not considered to be gales.

A *black ball* under the figures denoting force would (as before) indicate a *gale* of a force 8 or upwards, blowing at a station *inside* the circle.

Two black rings placed at right angles would indicate a *gale* of a force 8 or upwards, for blowing at a station *outside* the circle.

Read—A letter from Mr. Blanford asking for extracts from logs bearing upon the late cyclone at Calcutta.—Granted.

Mr. Scott presented the following statement regarding the present occupation of the various members of the office staff, and also regarding daily weather reports :—

GENTLEMEN,

AT Mr. Galton's request I submit the following statement of the present occupation of the staff of this office, exclusive of Capt. Toynbee and myself.

Front room, first floor.

Jas. S. Harding, jun.—Correspondence, Accounts, Register of Documents, &c.

R. Strachan—Care and Management of Instruments, and Correspondence therewith connected.

Jas. Harding—Assistance to his son in register of documents and control of accounts, especially those with the Telegraph Company, and occasional employment in conveying instruments to the Dockyards, &c.

Commissionaire—Regular employment as messenger, and occasional assistance in various ways, especially as to instruments.

Front room, second floor.

W. Salmon—Preparation of weather reports from 10 to 12 and also from 3¼ to 4. Reduction of logs.

F. Gaster—Discussion of returns from land observatories.

C. Harding—Weather reports from 10–11¼. Reduction of logs.

R. H. Curtis—Weather reports, 10–12, 3¼–4, and occasionally extra time. Reduction of logs.

Top room, third floor.

Goodwin White—Discussion of weather reports and Coast Guard returns.

Daily Weather Reports.

Of these, 12 style copies (transferring paper) and four written copies are required each day, with additional copies on Monday and Saturday.

The reduction of the telegrams takes three persons a quarter of an hour, commencing at 10 a.m.

In a quarter of an hour two sets of style copies (four each) and one ink copy can be taken.

In another quarter of an hour one other set of style copies and two more ink copies can be taken.

Thus at 10.45 there would be still remaining one ink copy to be written—telegrams which have come in late to be inserted, and remarks to be added.

In addition the afternoon reports require about three quarters of an hour of additional time from two persons.

These daily weather reports require the entire attention of three persons for 1½ hours, and two persons for ¾ hour in the afternoon, and in addition they are liable, from their constant irregularity, to require the attention of one person for at least one hour, exclusive of any time spent in their discussion.

(Signed) ROBERT H. SCOTT,

Director.

Feb. 24, 1868.

Resolved—At the suggestion of Colonel Smythe, that a sketch be drawn up by Mr. Scott, bringing together particulars regarding the various telegraph stations of the Committee.

The Secretary reported the observatory at Falmouth as now in operation.

The following cheques were drawn :

For Salaries, for February :—

	£	s.	d.
Mr. Scott - - - - -	66	13	4
„ Stewart - - - - -	33	6	8
Captain Toynbee - - - - -	29	3	4
Mr. Salmon - - - - -	16	13	4
„ J. S. Harding, jun. - - - - -	12	10	0
„ Strachan - - - - -	*15	0	0
„ Gaster - - - - -	8	6	8
„ C. Harding - - - - -	7	10	0
„ Harding, sen. (4 weeks) - - - - -	6	0	0
„ Curtis - - - - -	6	10	0
„ White (4 weeks) - - - - -	7	13	10
Rev. Thomas Kerr (Valencia) - - - - -	20	16	8

Accounts, &c. :—

J. S. Harding, jun., office expenses - - - - -	10	0	0
Electric Telegraph Company (4 months) - - - - -	215	15	0
Magnetic Telegraph Company, December 2d - - - - -	135	0	9
L. Casella, anemometers - - - - -	324	19	0
P. Adie, barographs and thermographs, 697l., less advance 200l. - - - - -	497	0	0
B. Stewart, on account for Kew - - - - -	50	0	0
L. Squire, allowance, Minutes, October 17, 1867 - - - - -	25	0	0

Total - - - - - £1,487 18 7

The Committee then adjourned until Monday, 2d March, at 3 p.m.

* Including extra allowance for instruments.

METEOROLOGICAL COMMITTEE.

2, Parliament Street, Monday, March 2, 1868.

PRESENT :

General Sabine in the Chair.

Mr. Galton.
Mr. Gassiot.
Dr. W. A. Miller.

Colonel Smythc.
Mr. De La Rue.
Captain Richards.

The Director and the Secretary to the Committee were in attendance.

The Minutes of the last meeting were read and confirmed.

Mr. Scott presented the following particulars regarding the various telegraph stations of the Committee :—

Station.	Observer.	Quality of Observations.	Remarks.
Nairn -	Mr. Penny, School-master.	Good -	Instruments in his house. Thermometers in a latticed shed in garden. Nairn does not appear to feel as much wind as southern stations. Barometer oscillates very violently.
Aberdeen -	Mr. Gibson, El. Tel. Superintendent.	Good -	Barometers in office. Thermometers on a N. wall at his house, well exposed. The sea disturbance at Aberdeen is judged of from a distance.
Leith -	Mr. Bolton, Mag. Tel. Clerk.	Indifferent, wants instruction.	Barometers in office. Thermometers outside the door, very badly placed. This will be amended. Sea disturbance worthless.
Ardrossan -	Mr. Love, Mag. Tel. Clerk.	Fair -	Barometers in office. Thermometers under roof of station, badly exposed. This will be amended.
Greencastle -	Mr. Kelly, Mag. Tel. Clerk.	Fair -	Instruments at office, well placed. The station is much sheltered by the Innishowen mountains from the west wind, and the sea disturbance is also untrustworthy.
Valencia -	Mr. Sullivan, Mag. Tel. Clerk.	Good -	Instruments in office at Knightstown, good situation.
Cape Clear -	Mr. Thomas Shipsey, Mag. Tel. Clerk.	Indifferent -	Instruments in office, situation good. Wet bulb was not mounted last August, and a boy 12 years old had been reporting. This has been amended.
Roche's Point	Mr. Kennedy, El. Tel. Clerk.	Fair, likely to improve.	Instruments in office. Situation fair, except as to exposure of thermometers. Wet bulb was found plunged in water. This has been amended.
Holyhead -	Mr. Andrews, El. Tel. Clerk.	Good -	Instruments in office. Thermometers were under roof of station. This has been amended. Sea disturbance worthless.
Liverpool -	Mr. Jones, Mag. Tel. Clerk.	Fair, wanted instruction.	Instruments in office, situation bad. Wind force was reported too low. S. E. winds very common. Sea disturbance worthless.
Penzance -	Mr. Gill, El. Tel. Clerk	Fair -	Instruments in office, situation fair. Station appears to be sheltered from the extreme force of S. W. winds.
Plymouth -	Mr. Pinchin, El. Tel. Clerk.	Fair -	Instruments in office, situation good.
Weymouth -	Mr. Silk, El. Tel. Clerk	Good -	Barometers in office. Thermometers were at his house in a bad situation. They have now been moved to the hotel yard.
Portsmouth -	Mr. Hardy, El. Tel. Clerk.	Fair -	Barometers in office. Thermometers at his house, fair situation.
London -	Mr. Strachan, Mr. Gaster, Mr. C. Harding, Clerks in the office.	Good -	Instruments at their houses. A mean of their observations is taken for each day.
Yarmouth -	Mr. Robinson, El. Tel. Clerk.	Indifferent -	Instruments formerly at Quay station, now at the Beach station. Wind force very much exaggerated.
Scarborough	Mr. Shaw, El. Tel. Clerk.	Good -	Instruments were at railway station, and thermometers under the roof. The barometers have now been removed to the Town station, and thermometers to a garden, good situation.
North Shields	Mr. Allaway, El. Tel. Clerk.	Fair -	Instruments were at office. Thermometer and rain gauge badly placed. These have now been removed to Mr. Allaway's house, good situation.

Mr. Scott reported that since the meeting of the 17th February last, applications for telegraphic weather intelligence have been received from the following places :—

Stonehaven,	Littlehampton,
Alloa,	Fraserburgh,
Cardiff (including Penarth),	Milford.

and also that the following places, having been approved by the Board of Trade, have been placed on the list of stations warned, since the same date :—

Middlesboro',	Montrose,
Yarmouth,	Portsoy,
Lossiemouth,	Youghal,
Tynemouth,	Buckie,
Hull,	Exeter.

Resolved—That Mr Stewart be authorized to get engravings of the self-recording instruments made, cost not to exceed 20/.

The following cheque was drawn :

Jas, S. Harding, jun. (office expenses) 25/.

The Committee then adjourned until Monday, 9th March, at 3 p.m.

METEOROLOGICAL COMMITTEE.

2, Parliament Street, Monday, March 9, 1868.

PRESENT :

General Sabine in the Chair.

Mr. Spottiswoode.

Dr. W. A. Miller.

Mr. Gassiot.

Colonel Smythe.

The Director and the Secretary to the Committee were in attendance.

The Minutes of the last meeting were read and confirmed.

Read—A letter from the Board of Trade regarding extraordinary tides.

Resolved—That Mr. Scott prepare a reply to be submitted at next Committee meeting.

Read—A letter from Captain Toynbee to Mr. Scott, pointing out the excellence of the log kept by Captain Alfred Fry, of the ship "Foam."

Resolved—That a letter be written to Captain Fry stating the high opinion the Committee have formed of the excellence of his log.

Mr. Scott read a draft of the explanation of the drum signal, with remarks concerning weather, which he had been directed by the Committee to prepare (see Minutes February 17, 1868).

The following cheques were drawn on account of expenses at observatories :

Mr. Stewart :				£	s.	d.			
For Professor Thomson	-	-	-	10	0	0			
Olive (Falmouth)	-	-	-	2	2	6			
Carriage of instruments	-	-	-	7	18	8			
Griffin & Sons	-	-	-	5	15	9			
Do.	-	-	-	6	4	3			
Do.	-	-	-	0	9	0			
Parkinson	-	-	-	6	0	0			
Do.	-	-	-	4	0	0			
Pattison	-	-	-	1	5	6			
Do.	-	-	-	1	3	6			
Tiller	-	-	-	2	1	6			
Long	-	-	-	3	8	11			
Hicks	-	-	-	0	18	0			
							51	7	7
Hopkins & Co.	-	-	-	23	0	4			
Do.	-	-	-	23	0	4			
							46	0	8
Lovell Squire :									
For Roberts	-	-	-	77	8	7			
„ Fox	-	-	-	15	13	5			
„ Griffin & Sons	-	-	-	5	7	3			
„ carriage of instruments	-	-	-	5	5	11			
							103	15	2
Standidge & Co.	-	-	-				18	10	0
T. Weeks	-	-	-				8	15	0
L. P. Casella	-	-	-				7	2	6
R. W. Munro	-	-	-				232	16	0
P. Adie	-	-	-				194	17	6
J. H. Dallmeyer	-	-	-				40	8	0
Total	-	-	-				703	12	5

The Committee then adjourned until Monday, March 16th, at 3 p.m.

METEOROLOGICAL COMMITTEE.

2, *Parliament Street*, Monday, March 16, 1868.

Present :

General Sabine in the Chair.

Mr. Galton.	Colonel Smythe.
Mr. Spottiswoode.	Mr. Gassiot.
Captain Richards.	Mr. De La Rue.

The Director and the Secretary to the Committee were in attendance.

The Minutes of the last meeting were read and confirmed.

Mr. Scott submitted some correspondence carried on by Captain Toynbee with Captain Fry, which was referred to Mr. Galton.

Mr. Scott reported that he had received a letter from Mr. Kerr, from which it appears that the fittings at Valencia are now complete, and that Mr. Kerr is about to return to Kew in order to fetch his instruments.

Mr. Scott submitted copies of Wind Results for the North and South Atlantic (*see* Minutes, 1867, p. 91), which were ordered to be printed.

Mr. Scott reported that, since the Meeting of the 2nd March, applications for Telegraphic Weather Intelligence had been received from the following places :—

Eyemouth and South Shields ;

And also that the following places, having been approved by the Board of Trade, had been placed on the list of stations warned, since the same date :—

Cardiff.	Penarth.
Fraserburgh.	Alloa.
Broughty Ferry.	Littlehampton.

The following cheque was drawn :

Rev. Thos. Kerr, fittings at Valencia - - - £100 10s.

The Committee then adjourned until Monday, 23rd March, at 3 p.m.

METEOROLOGICAL COMMITTEE.

2, Parliament Street, Monday, March 23, 1868.

PRESENT :

General Sabine in the Chair.

Mr. Gassiot.

Colonel Smythe.

The Director and the Secretary to the Committee were in attendance.

The Minutes of the last meeting were read and confirmed.

Read—A report from Mr. Galton, dated March 21st, with reference to Captain Fry.

Resolved—That Mr. Scott communicate with Captain Fry in terms of Mr. Galton's report.

Read—A letter from the Board of Trade asking if the Committee would object to the correspondence between the Office and the French Ministry of Marine being laid before Parliament.

Resolved—That Mr. Scott reply, stating that the Committee have no objection.

Read—A correspondence with the Board of Trade regarding additional meteorological stations in Scotland.

Resolved—That Mr. Scott prepare a draft reply to be laid before the Committee at its next meeting.

Mr. Scott reported that since the last meeting of the Committee two semaphores have been set in operation at Blackwall and one at Liverpool, and that he had taken steps to have notices posted and advertisements inserted in the newspapers. The trial to continue for one month.

Read—A letter from Mr. Whitley offering to the Committee 24 sea-temperature charts compiled by himself for 20 guineas.

Resolved—That Captain Richards be requested to examine these.

Mr. Scott presented the following report :—

I have the honour to report that I inspected the Reporting Station at Yarmouth on Friday, the 20th inst. I found the situation of the instruments to be good, being a marked improvement on the state of things which was found to be in existence at the time of my last inspection in March 1867. The thermometers have been set up at the Beach Station, where there is a good exposure to the air.

As regards the force of the wind, for which the clerk in charge of the instruments frequently reports a very high figure, I have hopes that this year I may be able to procure a site for an anemometer, so that the estimate of the force of the wind at 8 A.M., which is made loosely, may be replaced by an accurate observation of the velocity during a definite space of time preceding that hour.

The Committee of the Sailors' Home are willing to afford this Office any assistance in their power towards improving the quality of the meteorological reports which are sent up, and it is by their assistance that I hope to erect the instrument in question.

ROBERT H. SCOTT.

The Chairman of the Kew Committee presented certain accounts for the buildings and alterations at Kew, which are now complete.

For these and other accounts the following cheques were drawn :—

J. P. Gassiot (Chairman of the Kew Committee), for expenses connected with the Central Observatory :—

	£	s.	d.	£	s.	d.
Haywood, Tyler, and Co. - - -	1	5	0			
" " - - -	2	14	0			
J. Long - - -	24	2	4			
" - - -	5	8	7			
Kew Committee - - -	13	0	8			
" " - - -	208	0	0			
" " - - -	64	0	0			
	318	10	7			
Less amount advanced - - -	50	0	0			
				268	10	7
J. P. Gassiot :—						
Kew Committee, back work - - -	20	0	0			
" " assistance to Mr. Stewart - - -	35	0	0			
				55	0	0
J. P. Gassiot :—						
Kew Committee, testing apparatus (aneroids) - - -	10	0	0			
W. Munro, frame for " - - -	2	4	6			
				12	4	6
For expenses at Observatories :—						
Standidge and Co. - - -				8	15	0
J. Figgett - - -				8	13	0
Thomas Tiller - - -	17	11	6			
" " - - -	11	6	0			
				28	17	6
William Perrins - - -				9	9	10
J. Kemp - - -				34	8	6
Electric Telegraph Company, February - - -				56	11	0
Magnetic " " " - - -				52	14	4
Submarine " " Quarter ending December 1867 - - -				90	9	0
Fincher and Martyn, Semaphore Model - - -				8	12	0
Eastons, Amos, and Co., Semaphores - - -				228	3	8
Elliott Brothers, instruments - - -	146	2	0			
" " - - -	8	3	6			
				154	5	6
Rev. T. Kerr, expenses at Valencia, &c. - - -				51	11	2
Total - - -				£1,078	5	7

The Chairman of the Kew Committee stated that the sum of 70%. per annum voted to the Kew Observatory for assistance rendered to Mr. Stewart (see Minutes 1867, p. 71) had been considered by the Kew Committee as insufficient, and that the sum of 120% had been suggested as a fair remuneration for the work done.

Resolved—That the sum of 120%. for the next financial year be granted to the Chairman of the Kew Committee for this purpose.

The Committee then adjourned until Monday March 30th, at 3 p.m.

METEOROLOGICAL COMMITTEE.

2, Parliament Street, Monday, March 30, 1868.

PRESENT:

General Sabine in the Chair.

Mr. Gassiot.
Mr. Galton.
Capt. Richards.

Mr. Spottiswoode.
Col. Smythe.

The Director and the Secretary to the Committee were in attendance.

The Minutes of last meeting were read and confirmed.

At the suggestion of the Chairman, it was resolved that a copy of the Minutes of the Committee for the past year should be sent to the Royal Society, and also to the Duke of Richmond and to the Board of Trade.

Read—The following letter respecting extraordinary tides:—

SIR,

Board of Trade, Whitehall, March 9, 1868.
APPLICATION has been made to the Board of Trade to know whether information of unusually high tides, say on the west coast of Ireland, could be conveyed by telegraph to other parts of the United Kingdom so as to give warning before the tide arrives at such parts.

The Board of Trade will be much obliged to the Meteorological Committee if they, the Committee, can give the Board any information upon the question thus raised.

The Board of Trade presume that unusually high tides are generally connected with the state of the weather, and they think it possible that the resources of the Meteorological Committee may enable them to assist the Board, either by giving the information in question, or by pointing out how it is to be obtained, although the subject is not one that falls directly within the scope of the Committee.

Robert Scott, Esq.

I am, &c.,
(Signed) T. H. FARRER.

Resolved—That Mr. Scott reply as follows:—

SIR,

Meteorological Office, March 30, 1868.

I AM directed by the Committee to inform you, in reply to your letter of the 9th inst., that they have instituted inquiries as to the possibility of giving such telegraphic information of high or low tides as might be of practical utility.

The effect of high winds and storms in raising or lowering the level of the sea, in a manner independent of the action of the ordinary tidal wave, is well known, and in the tide tables for 1868 published by the Admiralty, p. 113, the following account of the phenomenon is given:—

“It remains to be noticed that the direction of strong winds, as well as the varying pressure of the atmosphere, considerably affect both the times and the heights of high water. Thus in the North Sea a strong N.N.W. gale and a low barometer raise the surface two or three feet higher, and cause the tide to flow all along the coast from the Pentland Firth to London half an hour longer than the times and heights predicted in the tables. Easterly, S.E., and S.W. winds produce opposite effects, which will be felt as far down the Channel as Dungeness. On the contrary, at the entrance of the Channel at Plymouth, and as far up as Portland, south-westerly winds, with a low barometer, raise the surface of the water; and north-easterly winds and a high barometer always lower it.”

The Committee are indebted to the kindness of Captain J. Hussey, Dockmaster of the East India Docks, for very valuable information relative to the tides in the port of London. From this it appears that tides which rose to an exceptional height in the port of London have only occurred 12 times within the space of 41 years. The predicted and the observed heights of the tides have been recorded daily in Captain Hussey's office for the last 32 years, and at the same time observations of wind and weather have been taken. Captain Hussey says:—

“The cause of extraordinary tides is (in conjunction with ‘spring tide time’) the wind blowing strong between West and South for some time previous, penning the water up the North Sea, and then a sudden change to any point between N.W. and N.E., driving the water back again. At all times we have higher tides than ordinary when we have a sudden shift of wind, such as I have mentioned; but to produce an extraordinary tide, there must be a conjunction of the causes stated, viz., spring tide and a sudden shift of wind, as described above.”

Captain Hussey's letter gives a very complete account of the phenomenon, and is precisely borne out by the table with which he has furnished the Committee.

I am directed accordingly to inform you that as the circumstance is of rare occurrence, any arrangements which could be made for the purpose of giving notice of it would be very seldom set in operation, so that the duty of sending such reports would be probably neglected.

Further, I am to state, that as the occurrence of high tides is due to local conditions which are well known at the different ports, it appears that the authorities at those ports would be better able to deal with it than any office which exists at present in London.

The ports can, as you are aware, obtain by application to this office any information as to the winds which they know to have an influence on their tides, the sole expense being one-half the cost of transmission of the telegrams.

Read—A letter from the Board of Trade, requesting that the Committee would give their opinion as to the advisability of printing returns from 17 new stations belonging to the Scottish Meteorological Society, at a cost of 68*l.*, instead of 10*l.* 4*s.*, as originally estimated (see Minutes, 1867, p. 55.)

Resolved—That Mr. Scott reply in the following terms:—

I am desired by the Committee to inform you, in reply to your letter of the 21st inst., that in their opinion the sum of 68*l.*, proposed as payment for the reduction of the returns from 17 new stations of the Scot. Met. Soc., does not seem excessive, considering the time and labour required for the necessary calculations.

As regards the advisability of increasing the number of stations from which returns are published by the Registrar General for Scotland, it appears to this Committee that that officer is the person who can best state to the proper authorities to what extent he deems it advisable that the observations published by him should be extended.

Mr. Scott reported that the Hydrographer had written to him, stating that he considered Mr. Whitley's charts of sea temperature to be worth 20 guineas.

Resolved—That the charts be procured on these terms.

Read—The following letter from the Statistical Committee of Lloyd's:—

SIR,

Lloyd's, London, E.C., 26 March 1868.

PERMIT me to request the favour of six copies of the "Explanation of the Apparatus, with a Map of Stations, &c., of Weather Reports relating to Notices of Storms by the Semaphores at Blackwall."

May I also express my sincere gratification that so practical a "Trial" is thus being given to the results of observations to which I should suppose all truly scientific men must look with deep interest.

I am, &c.,

HENRY JEULA,

Hon. Sec. Statistical Committee of Lloyd's.

Robert H. Scott, Esq.,
Director, Meteorological Office,
2, Parliament Street, S.W.

Read—A letter from M. Le Verrier, informing the Committee that the Scientific Association of France had placed at their disposal four gold medals to be distributed among the captains from whose logs extracts had been furnished to the association. (See Minutes, p. 5.)

Resolved—That Mr. Scott refer M. Le Verrier to the previous correspondence on this subject.

Mr. Scott reported that the Admiralty had granted permission to the office to send by their private wires storm warning messages to the various dockyards to which such wires have been laid down.

Mr. Scott reported that on closing the accounts for the year just elapsed he found that the expenditure would exceed the amount voted by Parliament by about 500*l.*, and that accordingly he had kept back the accounts for fittings at Aberdeen, and some other accounts, so as not to overdraw the amount in bank.

Resolved—That Mr. Scott be directed to terminate the arrangements for the supply of telegraphic information from Heart's Content, as soon as the three months for which the agreement was made shall have expired (*viz.*, on the 14th April). See Minutes, 1867, p. 78.

Mr. Scott was requested to prepare before next Committee meeting an estimate of the expenses for the next financial year, as far as they can be at present anticipated.

The Secretary reported that the Observatory at Aberdeen was in regular operation.

The following cheques were drawn:—

For salaries for March:—

	£	s.	d.	£	s.	d.
Mr. Scott - - - - -	66	13	4			
„ Stewart - - - - -	33	6	8			
Capt. Toynbee - - - - -	29	3	4			
Mr. Salmon - - - - -	19	3	4			
„ Harding, jun. - - - - -	15	0	0			
(a) „ Strachan - - - - -	17	10	0			
„ Gaster - - - - -	10	16	8			
„ C. Harding - - - - -	10	0	0			
(b) „ Harding, sen. - - - - -	7	10	0			
„ Curtis - - - - -	7	17	6			
(c) „ White - - - - -	9	12	3			
Rev. T. Kerr (Valencia) - - - - -	20	16	8			
				247	9	9
Mr. Scott, for extra work done by clerks during this quarter - - - - -	-	-	-	91	2	6
Of this amount 15 <i>l.</i> 15 <i>s.</i> is on account of the extracts made for M. Le Verrier.						
Magnetic Telegraph Co. (January) - - - - -	-	-	-	56	8	11
Submarine „ - - - - -	37	19	7			
„ „ (February) - - - - -	37	0	11			
				75	0	6
B. Ingram, advertising semaphores - - - - -	-	-	-	73	7	6
H. Smart, Liverpool agent - - - - -	-	-	-	8	1	5
E. Higgs, carpenter - - - - -	-	-	-	46	4	11
Negretti & Zambra, instruments - - - - -	52	8	6			
„ „ Admiralty ac/ - - - - -	11	12	0			
				64	0	6
L. P. Casella, instruments - - - - -	-	-	-	86	8	0
„ on account for Admiralty instruments - - - - -	-	-	-	30	0	0
P. Adie, instruments - - - - -	-	-	-	87	15	0
R. C. May, C.E. - - - - -	-	-	-	53	0	0
J. S. Harding, office expenses - - - - -	-	-	-	35	4	2
For balances due to Observatories:—						
Armagh - - - - -	58	6	8			
Falmouth - - - - -	29	1	6			
Aberdeen - - - - -	20	4	0			
Stonyhurst - - - - -	46	2	2			
Glasgow - - - - -	39	9	6			
				193	3	10
Dr. T. R. Robinson, fittings, &c., at Armagh - - - - -	-	-	-	159	1	4
				£1,306	15	1

The Committee then adjourned until Monday, April 6th, at 3 p.m.

(a) With extra allowance for care of instruments.

(b) (c) Calculated for five weeks. Clerks' salaries include increase for quarter ending 31st instant.

METEOROLOGICAL COMMITTEE.

2, Parliament Street, Monday, April 6, 1868.

PRESENT :

General Sabine in the Chair.

Mr. Gassiot.

Col. Smythe.

Mr. Galton.

The Director and the Secretary to the Committee were in attendance.

The Minutes of the last meeting were read and confirmed.

The Chairman submitted the following letter with reference to the copies of the Minutes which were sent to the Board of Trade :—

MY DEAR SIR,

5, Gloucester Terrace, Regent's Park, April 2, 1868.

THE Minutes of the Meteorological Committee will be very interesting to the public as well as to us. Ought they not to be laid before Parliament? Or does your Committee circulate them? May I ask for one or two copies for our own use.

Believe me yours very truly.

(Signed) T. H. FARRER.

Lieut.-General Sabine, R.A., F.R.S.

He was requested to send the following reply :—

MY DEAR SIR,

13, Ashley Place, April 6, 1868.

I READ your note of the 2nd to our Committee at their meeting this afternoon; they desired Mr. Stewart to send me three or four additional copies for the office (of the Board of Trade), according to your wish. I will forward them immediately I receive them. We had the minutes printed in order that each of our Committee members and of our officers might have a copy, with a few additional copies for your office, and for any occasion that might present itself. We did not contemplate our Minutes being laid before Parliament, but of course we can have no objection if it should be thought proper to do so.

We have thought it right to give one copy to the Royal Society, and we shall have about 20 copies to spare.

Sincerely yours,

EDWARD SABINE.

Mr. Scott presented the following statement showing the expenses of the Meteorological Office for the year 1867-8 :

- (1) Estimate (of 21st January 1867) for 1867-8. (2) *Expenditure from sum voted (£10,592 11 3).
(3) Estimated amount of unpaid Bills, chargeable to the year 1867-8.

	£	s.	d.	Estimated.	Expended.
Salaries—Officers	-	-	-	£ 1,550	£ 1,550
Clerks	-	-	-	0 0	0 0
				2,550 0 0	2,875 11 0
Expenses of Observatories	-	-	-	2,000 0 0	3,476 8 7
Outfits of ditto	-	-	-	1,700 0 0	1,226 12 1
Kew Observatory	-	-	-	-	376 10 0
Instruments—Mercantile Marine	-	-	-	300 0 0	324 0 9
Admiralty	-	-	-	400 0 0	0 0 0
Verification	-	-	-	50 0 0	0 0 0
Weather Books	-	-	-	150 0 0	0 0 0
Travelling Expenses	-	-	-	300 0 0	166 4 11
Carriage of Instruments	-	-	-	150 0 0	0 0 0
Agencies	-	-	-	300 0 0	49 18 10
Telegraphs	-	-	-	3,000 0 0	1,787 16 10
Contingencies	-	-	-	800 0 0	297 4 3
				£12,800 0 0	10,580 7 3
Amounts outstanding (estimated)—					
Outfit at Aberdeen	-	-	-	-	207 0 0
Telegraph Companies	-	-	-	-	264 0 0
Instruments (Admiralty)	-	-	-	-	65 0 0
					536 0 0
Balance in hand	-	-	-	-	12 4 0
Deficit	-	-	-	-	£523 16 0

* Including £22 11 3 on account of receipts from private sources.

Resolved—That Mr. Scott write to the Board of Trade stating that the accounts are ready for being audited.

Mr. Scott also presented a provisional estimate for the year 1868-9.

Resolved—That the officers and clerks be re-appointed for the financial year 1868-9, at the following salaries:—

	£	s.	d.
R. H. Scott (Director)	800	0	0
Capt. H. Toynbee (Marine Superintendent)	400	0	0
B. Stewart (Sec. Committee)	400	0	0
W. Salmon	210	0	0
Jas. S. Harding, jun.	160	0	0
R. Strachan	140	0	0
(and 50% additional for instruments.)			
F. Gaster	110	0	0
C. Harding	100	0	0
R. H. Curtis	83	10	0
Jas. S. Harding, sen.	78	0	0
G. White	100	0	0

Mr. Stewart reported that the Observatory at Armagh was now in readiness to observe.

The Committee then adjourned until Monday, 20th inst., at 3 p.m.

METEOROLOGICAL COMMITTEE.

2, Parliament Street, Monday, April 20, 1868.

PRESENT :

General Sabine in the Chair.

Mr. Gassiot.
Dr. W. A. Miller.
Captain Richards.

Colonel Smythe.
Mr. De La Rue.

The Director and the Secretary to the Committee were in attendance.

The Minutes of the last meeting were read and confirmed.

Mr. Scott reported that Mr. Collett, of the Anglo-American Telegraph Company, had called on him to request that the Company should be permitted to send the reports from Heart's Content free of expense to the Office for the present. Mr. Collett stated that he had received communications bearing on the commercial importance of these reports.

Mr. Scott said that he had suggested to Mr. Collett that a statement might be made by persons interested in the subject, to the effect that these reports were of value to persons engaged in the North American trade, which statement might be submitted to the Board of Trade, should it be desired to obtain permission to incur the expense of resuming the arrangement originally made with the Company for the service.

Mr. Scott reported that since the meeting of the 16th March, applications for telegraphic weather intelligence have been received from the following places :—

Hastings,
Blackpool,
Port Penrhyn,
Falmouth,

Southport,
Tralee,
Workington,

and also that the following places, having been approved by the Board of Trade, have been placed on the list of stations warned since that date :—

Falmouth,
Southport,
Tralee,
Workington,
Milford,

Eyemouth,
Hastings,
Blackpool,
Port Penrhyn,

and that by desire of the Admiralty the Royal Dockyards at Portsmouth, Chatham, and Sheerness have also been placed on the list of places warned.

Mr. Scott stated that in compliance with an application from him dated April 1st the Treasury had granted an imprest of 2,000*l.* to meet the current expenses of the Office, which had been lodged to the account of the Committee.

Mr. Stewart reported that in consequence of the photographic results from the Falmouth Observatory not being quite satisfactory, he had sent Mr. George Whipple on Saturday last to investigate into the cause.

Mr. Stewart explained the construction of an instrument designed to facilitate tabulation from the Barograph curves, and which he suggested might replace the tabulating instruments now in use, as soon as the constants of the various Barographs have been ascertained.

Resolved—That Mr. Stewart be authorized to have such a tabulating instrument constructed for the Kew Observatory.

The Committee then adjourned until Monday, May 4th, at 3 p.m.

METEOROLOGICAL COMMITTEE.

2, Parliament Street, Monday, May 4, 1868.

PRESENT :

General Sabine in the Chair.

Mr. Galton. Mr. Spottiswoode. Captain Richards.		Dr. W. A. Miller. Mr. Gassiot. Colonel Smythe.
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The Director and the Secretary to the Committee were in attendance.

The Minutes of the last meeting were read and confirmed.

Mr. Scott submitted the following correspondence regarding the accounts of the Office :—

SIR, Meteorological Office, April 9, 1868.
 I HAVE the honour to inform you that the accounts of this office for the year ended the 31st ultimo are closed, and I have to request that you will be good enough to inform me to whom they should be submitted for audit.

Thomas Gray, Esq.
 Assistant Secretary
 Board of Trade.

I am, &c.,
 (Signed) ROBERT H. SCOTT,
 Director.

SIR, Board of Trade, Whitehall, April 30, 1868.
 WITH reference to your letter of the 9th instant, relating to the audit of the accounts of the Meteorological Office, I am directed by the Board of Trade to enclose for your information a copy of a letter addressed to this department by the Treasury upon the subject.

R. H. Scott, Esq.,
 Meteorological Office.

I am, &c.,
 (Signed) THOMAS GRAY.

SIR, Treasury Chambers, April 27, 1868.
 WITH reference to your letter of the 17th instant, enclosing copy of a communication addressed to the Lords of the Committee of Privy Council for Trade by the Director of the Meteorological Office, requesting to be informed to whom the accounts of that Office should be submitted for audit, I am commanded by the Lords Commissioners of Her Majesty's Treasury to request that you will state to the Lords of the Committee that, as the sum of money placed at the disposal of the Meteorological Committee of the Royal Society is considered as a *contribution* towards the expenses of the researches undertaken by them at the request of H.M. Government, it is unnecessary that the accounts of the Committee should be subjected to audit on behalf of the public.

The Secretary to the Board of Trade.

I am, &c.,
 (Signed) WILLIAM LAW.

Resolved—That Mr. Gassiot and Mr. Spottiswoode be requested to act as auditors of the accounts.

A draft of the report was read and provisionally agreed to.

Mr. Scott submitted the results of an investigation which he had carried on with a view of tracing the connexion between the winds observed and the differences of barometrical pressure over these islands, as recorded in the Daily Weather Reports.

Resolved—That the same be printed as a Report to the Committee.

Mr. Scott reported that he had received permission from the Army Medical Department to copy such of their observations as might be required for M. Le Verrier.

Resolved—That Mr. Scott be authorized to have these copies made at the expense of the Office.

Mr. Scott presented a letter from the Board of Fisheries in Scotland, asking permission to remove a Fishery Barometer from Anstruther to Cellardyke.—Permission granted.

The Director reported that as there had been no quorum on Monday, April 27, the following cheques had been drawn by the members of Committee who had attended :—

Salaries for April :—				£	s.	d.
R. H. Scott	-	-	-	66	13	4
Balfour Stewart	-	-	-	33	6	8
Henry Toynbee	-	-	-	33	6	8
W. Salmon	-	-	-	17	10	0
J. S. Harding, junr.	-	-	-	13	6	8
*R. Strachan	-	-	-	15	16	8
F. Gaster	-	-	-	9	3	4
C. Harding	-	-	-	8	6	8
R. H. Curtis	-	-	-	6	19	2
†J. S. Harding, senr.	-	-	-	6	0	0
†G. White	-	-	-	7	13	10
Thomas Kerr (Valencia)					218	3 0
					20	16 8
Accounts, &c. :—						
Elliott Bros. ; chemical balance, Aberdeen	-			4	16	0
MacAndrew (Aberdeen)	-	-	-	207	9	4
Electric Telegraph Co. :—						
Messages, March	-	59	14 1			
Charges, Jan., Feb.	-	28	9 9			
					88	3 10
Magnetic Co., March account	-	-	-	55	12	10
Submarine Co. " "	-	-	-	39	7	2
N. Whitley ; Sea-temperature charts	-	-	-	21	0	0
					416	9 2
J. Harding, junr. ; office expenses	-	-	-		25	0 0
Total					£680	8 10

The Committee then adjourned until Monday, 18th inst., at 3 p.m.

* Including extra allowance for instruments.

† For four weeks.

METEOROLOGICAL COMMITTEE.

2, Parliament Street, Monday, June 1, 1868.

PRESENT :

Mr. Gassiot in the Chair.

Mr. Galton.
Capt. Richards.
Col. Smythe.

Dr. W. A. Miller.
Mr. De La Rue.

The Director and the Secretary to the Committee were in attendance.

The minutes of the last meeting were read and confirmed.

Mr. Scott submitted the report of his visit to the telegraphic stations of Penzance, Plymouth, Weymouth, and Portsmouth.

REPORT.

GENTLEMEN,

Meteorological Office, 2, Parliament Street, London, S.W.

I HAVE the honour to report that I visited the telegraphic reporting station at Plymouth on the 27th May. I found the barometers in good order and properly attended to. The dry and wet bulb thermometers were attached to a wall at the rear of the office in a situation which is reasonably good. The wet bulb was kept too wet.

The maximum and minimum thermometers were not in use, so that the extreme temperature reported was untrustworthy.

The sea disturbance is not quite trustworthy as the observations of it are necessarily made from some distance.

I have given instructions to Mr. Pinchin which will, I hope, improve the quality of his reports, especially as regards the use of his maximum and minimum thermometers.

On the 28th I inspected the station at Penzance. Mr. Gill, the clerk in charge, had his instruments in good order, except two which were defective.

Here, as at Plymouth, the maximum and minimum thermometers were not in use at all, and the ordinary thermometers were attached to a post under the roof of the railway station. I have selected a situation for the thermometers in a yard adjoining the station, which will be preferable to that where they now are, and as in the case of Plymouth I have instructed Mr. Gill to observe the maximum and minimum thermometers regularly.

On looking at Mount's Bay, I am not disposed to think that it is materially sheltered from S.W. winds, as reported last year. The hills are not high, and are nearly uniform in height on the south and west of the town.

On the 29th I inspected the station at Weymouth, and found everything very clean and in good order; the position of the thermometers was very much improved, owing to the directions given to Mr. Silk last year; however, the maximum thermometer is not quite protected from the sun. This will be amended for the future.

On the 30th I inspected the station at Portsmouth, and found everything very much improved since the date of my visit last year. The wet bulb thermometer is mounted quite correctly now. The only instrument which is not satisfactory is the rain-gauge, which is rather too near to a tree. I do not at present see where a better situation can be found for it.

On the whole I am glad to say that there is a very marked improvement in the two stations which I had visited before, and that all the four observers seem very intelligent and anxious to do the work properly.

I have the honour to be, &c.,

ROBERT H. SCOTT.

Mr. Scott submitted also the following report of a visit to the agencies at Bristol and Southampton :—

Meteorological Office, 2, Parliament Street, London, S.W.

May 30, 1868.

GENTLEMEN,

ON Tuesday the 25th May I went to Bristol, and on inquiring for the agent of the office, Mr. Hyde, I found that he had left Bristol for some years, and had handed over the instruments and the agency business to Messrs. Hill and Price, his successors in the business of optician. No returns have been received at the office from Bristol for more than two years, and I found a large collection of instruments, many of them defective, at the agency.

I have directed Messrs. Hill and Price, as a preliminary measure, to supply me with any information which they can collect as to the disposal of the instruments since March 1866, and to return defective instruments, that they may be either repaired or condemned.

On Saturday, May 30, I visited Mr. Stebbing, the agent at Southampton, and have made arrangements with him to the effect that all instruments should be returned to London, on the understanding that if Mr. Stebbing should receive applications for instruments, he should transmit the applications to London, when instruments can be sent down without difficulty.

By this means the trouble entailed on Mr. Stebbing of keeping separate agency accounts, &c., will be prevented.

I have the honour to be, &c.,

ROBERT H. SCOTT.

Resolved—That Mr. Scott be authorized to withdraw the instruments from the agents in Southampton and Bristol.

The report was then considered and approved.

Read a letter (forwarded by the Colonial Office) from Governor Rawson to the Duke of Buckingham regarding the recent hurricane in the Bahamas, and suggesting a method for obtaining information on hurricanes.

Resolved—That Mr. Scott prepare a reply to be laid before the Committee at its next meeting.

Read—A letter from Mr. Farrer relative to the communication by the Meteorological Committee to a scientific society of the scientific facts which they derive from their labours.

Resolved—That the Meteorological Committee communicate to the Royal Society the results of the experiments on aneroids made by Mr. Stewart.

In the account of these experiments the aneroids received from the various makers will be numbered as follows:—

No. 1 denotes a $4\frac{1}{2}$ -inch aneroid, compensated for temperature, made by Messrs. Negretti and Zambra.

Nos. 2, 3, 4, 5, denote $4\frac{1}{2}$ -inch aneroids, compensated for temperature, made by P. Adie.

Nos. 6 and 7 denote $4\frac{1}{2}$ -inch aneroids, compensated for temperature, by Elliott, Brothers.

No. 8 denotes a $4\frac{1}{2}$ -inch, by Hicks.

9 „ $4\frac{1}{2}$ -inch, by Adie.

10 „ $2\frac{1}{2}$ -inch, by Cooke.

11 „ $2\frac{3}{4}$ -inch do.

12 „ 2-inch, by Hicks.

13 „ 2-inch, by Casella.

14 „ $4\frac{1}{2}$ -inch, by Cooke.

15 „ 4-inch, by Elliott.

16 „ $2\frac{1}{2}$ -inch, by Cooke.

17 „ 2-inch, by Elliott.

Mr. Scott reported that as there had not been a quorum of Committee on the 25th ult., the following cheques had been drawn by those members of Committee who had attended:—

Salaries, for May:—

	£	s.	d.
R. H. Scott - - - - -	66	13	4
Balfour Stewart - - - - -	33	6	8
H. Toynbee - - - - -	33	6	8
W. Salmon - - - - -	17	10	0
J. S. Harding, jun. - - - - -	13	6	8
*R. Strachan - - - - -	15	16	8
F. Gaster - - - - -	9	3	4
C. Harding - - - - -	8	6	8
R. H. Curtis - - - - -	6	19	2
†J. S. Harding, sen. - - - - -	6	0	0
†G. White - - - - -	7	13	10
Rev. T. Kerr (Valencia) - - - - -		218	3 0
		20	16 8

Accounts:—

L. P. Casella, "A." instruments - - - - -		64	15 6
Electric Telegraph Company:			
Messages, April account - - - - -	51	7	0
Station charges, March - - - - -	15	10	2
Magnetic Telegraph Company, April - - - - -		66	17 2
Submarine " " - - - - -		51	5 2
J. S. Harding, jun., office expenses - - - - -		38	11 7
		35	0 0
Total - - - - -		£495	9 1

* Including extra allowance for care of instruments.

† Four weeks salary.

Mr. Scott reported that since the meeting of the 20th April applications for telegraphic weather intelligence had been received from Berwick, Dunbar, and Belfast, and that these places, having been approved by the Board of Trade, had been put on the list of stations warned.

On the motion of Mr. Galton it was resolved that Mr. Stewart be requested to report to the Committee as to the best method in his opinion of co-ordinating the records of the different observatories for the purpose of indicating the progress of weather.

The Committee then adjourned until Monday, 15th June 1868, at 3 p.m.

METEOROLOGICAL COMMITTEE.

2, Parliament Street, Monday, June 15, 1868.

PRESENT :

General Sabine in the Chair.

Captain Richards.
Mr. Galton.

Col. Smythe.
Mr. Gassiot.

Dr. W. A. Miller.

The Director and Secretary to the Committee were in attendance.

The minutes of the last meeting were read and confirmed.

Mr. Scott reported that the estimates for the office had been passed by the House of Commons on Thursday the 4th inst., and he was instructed by the Committee to apply for the balance of the money, and pay the same into the London and Westminster Bank on deposit.

Mr. Scott submitted the draft of a letter to the Secretary of the Colonial Office regarding Governor Rawson's suggestions (see Minutes, June 1st, 1868, page 40).—Approved by the Committee.

Read—A letter from M. Le Verrier asking whether the Committee would assist in the study of the thunderstorms of Europe by organizing observations of those felt in the British Isles.

Resolved—That Mr. Scott write to M. Le Verrier asking him to give particulars of the information required by him.

Mr. Scott stated that he had received an application lately from the Board of Trade asking whether the Committee wish the observations from lighthouses abroad (such as that in the Falkland Isles) to be continued, and if so whether they will construct forms for the purpose.

Resolved—That Mr. Scott report thereon to the Committee at their next meeting.

Read—A letter from Mr. Buchan, Secretary to the Scottish Meteorological Society, asking for tracings of the Meteorological records of the Glasgow Observatory for April 29th.

Resolved—That Mr. Scott be authorized to send these.

Read—A letter from Captain Fry acknowledging receipt of the instruments presented to him by the Committee.

Read—A letter from Captain Lecky, S.S. "Uruguay," accompanying his log from Liverpool to Monte Video, which was very carefully kept, and which was submitted to the inspection of the Committee.

Mr. Scott mentioned that new Instructions for Meteorological Telegraphy were required, as the clerks did not seem to have a clear conception of their duties.

He submitted the draft of certain instructions for this purpose which he had compiled, and he was requested to have it put into type.

With respect to Resolution (see Minutes, 1867, page 32), Mr. Scott submitted a revise of the Fishery Barometer Manual, and he was requested to have it put into type.

He was also requested to examine the Barometer Manual with the view of preparing a new edition.

The Committee then adjourned until Monday, the 22d inst., at 3 p.m.

METEOROLOGICAL COMMITTEE.

2, Parliament Street, Monday, June 22, 1868.

PRESENT :

Dr. W. A. Miller in the Chair.

Mr. Gassiot.
Mr. Galton.

Colonel Smythe.

The Director was in attendance.

The Minutes of the last meeting were read and confirmed.

Read—A letter from the Salvage Committee of Lloyd's, recommending that the Weather Semaphore should be used for giving daily intelligence of winds, in addition to its use in connexion with storms.

Mr. Scott was instructed to thank the Committee for their suggestion, and to inform them that the subject had been already brought under the notice of the Meteorological Committee, but they were anxious to establish the apparatus as a means of giving intelligence of storms before they took any steps towards making use of it to give information of daily weather.

Read—A letter from Capt. J. Y. Creasy, Inspecting-Commander of Coastguard at Banff, requesting that copies of the Daily Weather Report should be sent to Banff, Buckie, and Cullen, in accordance with the circular issued by the Committee in March 1867. (See Minutes 1867, p. 27.)

Mr. Scott was instructed to inform Capt. Creasy that the three towns named were not of sufficient magnitude to be considered as "ports," so that the request could not be complied with, as copies had to be made by hand at considerable expense of time.

He was further instructed to make inquiries as to the possibility of having the reports printed, so as to save the clerks' time required to make manuscript copies, and to report thereon to the Committee.

The Committee then adjourned until Monday, the 29th inst., at 3 p.m.

METEOROLOGICAL COMMITTEE.

2, Parliament Street, Monday, June 29, 1868.

PRESENT :

General Sabine in the Chair.

The Hydrographer.
Mr. Gassiot.

Colonel Smythe.
Mr. Spottiswoode.

The Director and the Secretary to the Committee were in attendance.

The minutes of the last meeting were read and confirmed.

Mr. Scott presented the following list of foreign stations from which meteorological observations are received, and he was authorized to construct forms to be used in such observations :—

LIST of FOREIGN STATIONS from which Meteorological Observations are received
periodically, with Observers, &c.

Station.	Observer.	Office Instruments.	Nature of Observations.	No. of years in Office.	Value.
Bermuda - -	Dockyard authorities.	Self-recording Anemometer	Anemometer Records -	7 years (1½ yrs. pubd. in No. 8.)	Very good.
Falkland Islands : Cape Pembroke -	Light-keeper	Barometer and Thermometers	Lighthouse Registers -	7 years	Good.
Fiji Islands : Levuka - - -	Consul -	Complete set	Monthly Registers - -	4½ years	2 years very good, rest indifferent.
Hamburg - -	Dr. Rümker	None	Daily Wind and Weather Reports.	7 years	Very little information.
Messina - -	Consul -	None	Daily Barometer Readings with Wind and Weather Reports.	12 years	Indifferent.
Navigators Islands : Samoa, &c. -	Consul -	Complete set	Monthly Registers - -	1½ years	Moderate.
Siam : Bangkok - -	Dr. Campbell	Complete set	Weather Book Registers	9 years	Very good.
Western Australia : Breaksea Island - Point King -	Light-keeper Light-keeper	Barometer and Thermometers	Lighthouse Registers -	6½ years	Part good.

Mr. Scott reported that a number of Hydrometers had been furnished by a maker with corrections greater than those fixed by contract, and he submitted a copy of the correspondence between the Kew Committee and Admiral FitzRoy relative to the rejecting limits of these instruments.

Resolved—That the Kew Committee be requested to reconsider the subject of instruments, and that for this purpose they be furnished with a copy of the above correspondence.

Mr. Scott reported that he had ascertained that the Stationery Office would undertake to have 50 lithographed copies of the Daily Report made and forwarded to the office before 3 p.m., and he was authorized to make the necessary arrangements for the purpose.

Mr. Scott reported that he had received the balance of the Parliamentary vote and had lodged it in the Bank of England, and he requested that the Committee would draw a cheque for 7,000*l.* for lodgment in the London and Westminster Bank on deposit, in the

joint names of the Committee, with his own name, cheques to be drawn in same manner as ordinary accounts, pursuant to instructions contained in minute of the 15th inst.

The cheque for 7,000*l.*, being No. 00131, was accordingly drawn.

The Secretary presented the following suggestions regarding the best method of co-ordinating the results of the self-recording observatories with the view of indicating the progress of weather.

SUGGESTIONS to the Meteorological Committee on the best Method of co-ordinating the Results of the Self-recording Observatories with the view of indicating the Progress of Weather.

1. *Storm anemograms.*—Of the several varieties of weather, the most important, and that which naturally claims the first place in the discussions of this Committee, would appear to be violent gales or storms of wind. Moreover, as the present functions of the Committee, with regard to such storms, are confined to a general announcement of their occurrence whenever they reach these islands, it would appear to be of much importance to utilize the anemograms of the various observatories with the view of ascertaining the rate and direction of progress of such storms, and also of estimating their comparative violence in the various quarters of our islands. With this view it is proposed to deal with storms, *in the first place*, as phenomena apart by themselves, of which it is desirable to ascertain the laws, without considering at present whether or not they are connected with any other meteorological phenomena.

2. *Separating value.*—It is proposed that whenever the anemogram tabulations give an hourly velocity of 30 miles or upwards, such should be considered as storm values. But inasmuch as between two storm values the wind, although not reaching 30 miles an hour may yet be strong, it is proposed to reckon all velocities of 25 miles and upwards to 30 miles as *strong wind values*, and to attach to the storm all *strong wind values* or series of such values of which one end of the series is not more than 24 hours removed on either side from some storm value. Thus it is considered necessary, in order to constitute a storm, that there should be one or more storm values; but once these have been obtained, we attach to them all *strong wind values* fulfilling the above conditions.

3. *Numerical estimate of violence.*—The destructive effect of a storm may be estimated by the pressure which it exerts against an obstacle, and this is believed to vary with the square of the velocity. If, therefore, we consider as our *unit storm pressure* that corresponding to the velocity of 30 miles an hour, we shall have the destructive effect of a velocity v represented by $\frac{v^2}{30^2}$; obtaining this quotient for each hourly velocity of 30 miles or upwards that occurs in the record of a storm at any station, and adding these together, we shall have a numerical estimate of the *total storm pressure* of that storm at that station. Besides this, it might be desirable to record the number of hours during which there blew a storm, and the number during which there blew a strong wind.

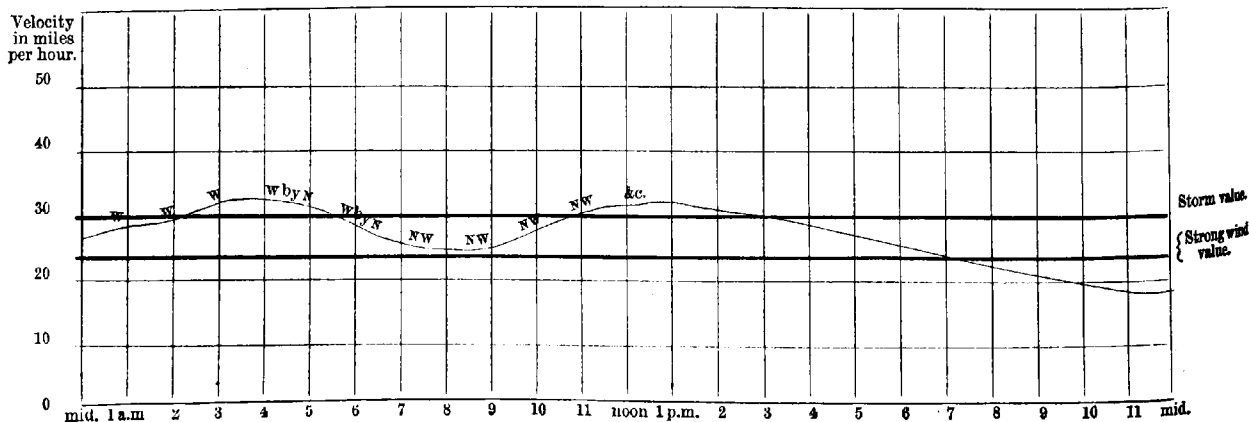
4. *Forms for recording.*—The records of the various observatories might be gone over, and the various hours which fulfil the conditions described above might be marked in pencil, the *storm values* with one mark and the *strong wind values* with another. These marked values might then be separately entered on forms similar to those which are herewith submitted to the Committee. It will not take much labour to fill in such forms for the various observatories. Those for April and May for five observatories were filled in at Kew in less than one day. These forms may be called *storm anemograms*.

5. *Separation into individual storms.*—It is not proposed that these storm anemograms should be published as they are obtained, but that they be used for furthering the progress of the work. In glancing over these storm anemograms it will be comparatively easy to separate the whole mass into individual storms. Thus for April and May there will be—

- (1.) Storm, April 5 to 8.
- (2.) Storm, April 16–24 (probably double).
- (3.) Storm commencing on April 27th (probably double).
- (4.) Storm of May 11–13.
- (5.) Storm of May 20–31.

6. *Graphical representation.*—Even if graphical representations of these storms are not published, yet such representations will, it is believed, materially assist the Committee in the present discussion, for points of similarity or contrast are caught by the eye from such representations much more readily than from mere tables.

The following form of graphical representation is suggested :—



Let us suppose that the separation into individual storms has been made, and let us take some one storm, such as that of April 16-24. It did not last during this whole time at each station, but it appeared at some one station on April 16, and it lasted at some one station until April 24. I think that in the graphical representation a continuous record should be given for each station, extending from the time when the storm first appeared at any one station to the time when it disappeared from all the stations; perhaps it might even be well that the record should extend slightly to both sides of these limits.

The most convenient form of record is probably that proposed by Dr. Robinson, namely, a curve of which the abscissæ represent times and the ordinates velocities, the hourly direction of the wind being printed either in numbers or points on the back of the curve. A specimen of this method is submitted to the Committee. It ought to be observed that every sudden change of wind should be noted, and also whether this has taken place by veering or by backing.

7. *Stations to be made use of.*—The Committee have of course their own observatories, including Halifax. Besides these, might it not be desirable to make use of the Orkney records if they are found to be good, and also of the Liverpool records which might be furnished by Mr. Hartnup?

8. *Scale, &c., of graphical representation.*—The curves indicated as above for the various observatories during any one storm might be placed the one under the other, so as to have one time scale, and the size might be so arranged that one moderately large sheet might exhibit all the storm anemograms of the various stations for any one storm. It is perhaps premature to fix on the order in which these should be placed, if indeed this ought not to vary with the nature of the storm.

9. *Characteristics of each storm.*—The characteristics of each storm, as conveyed to the eye by the graphical method, might be described in a few concise but sufficiently clear expressions. These descriptions would form an epitome of the behaviour of the various storms, and along with the graphical representation might serve as the basis for useful generalisations.

The following is an attempt to characterize the storms of May:—

CHARACTERISTICS OF STORMS OF MAY 1868.

(A.) *Storm of May 11-13.*

FALMOUTH.

On May 11th, at 3 p.m., a strong *southerly* wind set in at Falmouth, and ended from the same direction on midnight of that day. It blew as a strong wind 6 hours, and as a storm 2 hours; total storm pressure 2·000.

GLASGOW.

On May 13th, at noon, a strong *southerly* wind set in at Glasgow, and ended from that quarter at 6 p.m. of that day. It blew as a strong wind 5 hours, and as a storm 2 hours; total storm pressure 2·210.

This storm was not felt at KEW, STONYHURST, and ABERDEEN.

(B.) *Storm of May 20-31.*

FALMOUTH.

On May 20, at noon, a strong *southerly* wind set in at Falmouth. It showed a tendency to *veer* to the *west* and go back to *south*. It ended on May 26, at 4 p.m., from *south-west*.

It blew as a strong wind 38 hours, and as a storm 22 hours; total storm pressure 28·005.

GLASGOW.

On May 20, at 3 p.m., a strong *southerly* wind set in at Glasgow, *veering* to *west*, and *backing* again to *south*; it ended as a *south west* gale on May 31, at 3 p.m.

It blew a strong wind 22 hours, and as a storm 24 hours; total storm pressure 29·513.

STONYHURST.

On May 23, at 11 a.m., a strong *southerly* wind set in at Stonyhurst, with a tendency to *veer* to *west*, and *back* again to *south*; it ended as a *south-west* gale on May 26, at 4 p.m.

It blew a strong wind 9 hours, and as a storm 4 hours; total storm pressure 4·210.

ABERDEEN.

On May 26, at 1 p.m., a strong *southerly* wind sprang up at Aberdeen, ending at 4 p.m. of that day. It blew as a strong wind 2 hours, and as a storm 2 hours; total storm pressure 2·206.

This storm was not felt at KEW.

It would appear that the first of these two storms, or (A.), is a small *southerly* one, felt at FALMOUTH and GLASGOW, but unfelt at KEW, STONYHURST, and ABERDEEN.

The second storm (B.) is also a *southerly* one, at least at its beginning, with a tendency to end from the *south-west*. It also was felt most strongly at FALMOUTH and GLASGOW, and very slightly at STONYHURST and ABERDEEN. At KEW it was not felt.

The following cheques were drawn :—

For Salaries :—

	£	s.	d.	
R. H. Scott - - - -	66	13	4	
H. Toynbee - - - -	33	6	8	
B. Stewart - - - -	33	6	8	
W. Salmon - - - -	17	10	0	
J. S. Harding, jun. - - -	13	6	8	
*R. Strachan - - - -	15	16	8	
F. Gaster - - - -	9	3	4	
C. Harding - - - -	8	6	8	
R. H. Curtis - - - -	6	19	2	
†J. S. Harding, sen. - - -	7	10	0	
†G. White - - - -	9	12	3	
				221 11 5
Rev. T. Kerr (Valencia) - - -				20 16 8

Accounts, &c. :—

Electric Telegraph Co. :—

Special charges, April - - -	24	17	4	
„ „ May - - -	15	12	9	
				40 10 1
Magnetic Telegraph Co., May - - -				48 5 4
Submarine „ - - -				35 13 3
R. F. North, paraffin oil - - -				15 1 3
H. Smart, Liverpool agent - - -				6 4 8
Litho-photographic Institute, lithography - - -				6 2 6
J. S. Harding, jun. ; office expenses - - -				25 0 0
‡ Rev. T. Kerr ; stores for observatory - - -				39 8 9
„ „ on account for current expenditure - - -				50 0 0
				£508 13 11

The Committee then adjourned until Monday, 6th July, at 3 p.m.

* With extra allowance for care of instruments.

† Five weeks.

‡ Drawn 8th June.

METEOROLOGICAL COMMITTEE.

2, Parliament Street, Monday, July 6, 1868.

PRESENT :

General Sabine in the Chair.

Mr. Gassiot.
Mr. Galton.

The Hydrographer.
Col. Smythe.

The Director was in attendance.

The minutes of the last meeting were read and confirmed.

The consideration of the "Suggestions as to co-ordinating the Results of the Self-recording Observatories," made by the Secretary at last meeting, was deferred until the first meeting in November.

Mr. Scott was requested to consider the subject, and to submit his views thereon to the Committee at the same meeting.

Mr. Scott reported that he had lodged the sum of 7,000*l.* on Deposit in the London and Westminster Bank (St. James's Square Branch), as instructed.

Mr. Scott submitted lithographed proofs of the three curves furnished by the Observatories of Kew, Stonyhurst, and Glasgow, for the 24th Jan. 1868.

He stated he had received an approximate estimate from Messrs. Day and Son for the execution of daily curves from eight Observatories, similar to the proofs submitted. The expense of such a publication would be about 1,100*l.* per annum for 250 copies, and 1,350*l.* for 500 copies.

He further submitted, at Mr. Galton's suggestion, a tracing showing all the curves furnished by one observatory on the same form. The number of plates required daily, in this case, for the entire amount of information to be afforded would be one instead of three in the former case. The cost would accordingly be very materially reduced.

He also submitted a short Explanation of the method adopted in preparing these lithographs from the original curves.

Resolved—That Mr. Scott be instructed to have a number of these lithographs executed, viz., four days on the first system of three plates daily, and nine days on the second system of one plate daily, that the Explanation be printed in the same size, and that 50 copies of the whole be struck off for private circulation by Members of the Committee.

The subject to be reconsidered after the Recess.

The question of the supply of unpublished information to persons applying for it having been discussed, Mr. Scott was requested to draw up a form of reply stating the terms on which access could be granted to the unpublished materials for meteorological investigations which are in the hands of the Committee.

The Committee then adjourned to Monday, July 13, at 3 p.m.

METEOROLOGICAL COMMITTEE.

2, Parliament Street, Monday, July 13, 1868.

PRESENT :

Mr. De La Rue in the Chair.

The Hydrographer.
Mr. Galton.

Col. Smythe.
Mr. Spottiswoode.

The Director was in attendance.

The minutes of last meeting were read and confirmed.

The proofs of the lithographed curves and explanation having been re-submitted to the Committee, and some slight discrepancies between the curves and the weekly tabulations having been pointed out,

Resolved—That the consideration of the subject be postponed until Mr. Stewart's return, and that meanwhile his attention be drawn specifically to this question.

Mr. Scott submitted a letter from M. Le Verrier, stating that he had received permission to present to the Committee 12 additional copies of the "Atlas des Mouvements Généraux de l'Atmosphère," which had been ordered for the office. He reported that he had written at once to M. Le Verrier, to express the sincere thanks of the Committee for this valuable donation.

Approved.

Mr. Scott reported that he had received a letter from Mr. Murray, Assistant Under-Secretary to the Foreign Office, enclosing half-yearly reports from the Consuls at Messina and Carthagen, and asking whether the Committee wished that these observations should be continued.

Mr. Scott stated that as these reports were very incomplete (see Minutes, p. 47), he had sent to Mr. Murray the following reply :—

SIR,

Meteorological Office, July 10, 1868.

I AM instructed by the Committee of this office to acknowledge with thanks the receipt of the Meteorological reports sent by H.M. Consuls, at Messina and Carthagen respectively, for the six months ending on the 30th ult.

With reference to the concluding paragraph of your letter, in which you ask "Whether these reports are of sufficient value to be continued, or whether the Consuls may cease to forward them," I have to inform you that, as the amount of information contained in the reports forwarded by the Foreign Office, viz., those from Messina, Carthagen, and also from Hamburg, is not considerable, and as this office is not in possession of intelligence relative to the condition or quality of the instruments, of the hours of observation, or of the competence of the observers for the duty of making accurate Meteorological observations, their value cannot be great.

I am further to explain to you, that when the management of this office was transferred by the Board of Trade to the present Committee, the latter expressly stated that they could not undertake the discussion or publication of observations made on land outside the limits of the British Islands (see Parliamentary Paper, No. 240, Sessions 1866-7.)

At the same time I have to express the sincere thanks of the Committee to Her Majesty's Secretary of State for Foreign Affairs for the readiness which he has always shown to communicate all information which reaches him, to this office, of which they are duly sensible.

I have the honour to be, &c.,

(Signed) ROBERT H. SCOTT,
Director.

James Murray, Esq.,
Assist. Under Secretary, Foreign Office.

Approved, under the circumstances of the case.

Mr. Scott stated that he had received from the Board of Trade the following list with reference to the stations to which the Forms for Land Observations, ordered to be prepared (see Minutes, page 47) might be sent.

LIST of COLONIAL LIGHTHOUSES under the Jurisdiction of the Board of Trade.

Colony.	No. of Lights.
Bahamas - - - - -	9
Sombrero Island - - - - -	1
Falkland Islands - - - - -	1
King George's Sound (Western Australia) - - - - -	2
*Cape Race (Newfoundland) - - - - -	1
*Little Basses Light Ship (Ceylon) - - - - -	1

Resolved—That Mr. Scott be instructed to inform the Board of Trade that the Committee would be glad to furnish Forms for all the above Stations except the two last (Cape Race and the Little Basses) if the Board of Trade wished to have them.

Mr. Scott reported that he had been in correspondence with Professor Wolf, President of the Meteorological Commission of Switzerland, with reference to a cheap form of anemometer to register pressure, which might be used at the telegraphic reporting stations, so as to supersede the present system of estimating the force of the wind.

Read—Letter from Professor Wolf, stating that the results given by the instrument were not so satisfactory as to enable him to recommend its use to the Committee.

Resolved—That the Director be requested to turn his attention especially to the subject of obtaining true reports of the force of the wind by means of a cheap form of anemometer.

The following form of reply to applications for unpublished information, ordered at last meeting to be prepared, was read and approved :—

SIR,

I AM instructed to inform you that the Committee have decided that—

“ Any public body that wishes to have a copy of any unpublished meteorological information which is in the office can obtain it by stating the nature of the information required, the object for which it is wanted, and by paying the expense of copying ” (*vide* Report, p. 11).

I am further to state, that in case of the publication of such information or of results derived wholly or in part from it, an acknowledgment of the source from which it has been obtained must be annexed.

Read—The following letter from Mr. Kerr :—

SIR,

Meteorological Observatory, Valencia, July 3, 1868.

IN accordance with your directions, I beg to submit the following in connexion with the expenditure at Valencia Observatory :—

	£	s.	d.
Clerk's wages per month - - -	-	8	5 0
Messenger „ „ - - -	-	1	0 0
Do. allowance for board per month - - -	-	1	10 0
Forage per month - - -	-	3	0 0
Fuel and lights „ „ - - -	-	5	0 0
Contingencies „ „ - - -	-	2	0 0

I remain, &c.,

THOMAS KERR,
Director.

The Director, M.O., London.

As the foregoing estimate amounts to a monthly total of 20*l.* 15*s.*, Mr. Scott submitted that the annual expense of the Observatory at Valencia would be—

	£	s.	d.
Director's salary - - -	-	250	0 0
Annual expenses of Observatory - - -	-	249	0 0
Rent - - -	-	50	0 0
Total - - -	-	549	0 0

(exclusive of chemicals, &c.)

Resolved—That Mr. Kerr's estimate be approved, but that Mr. Scott be directed to draw his special attention to the necessity of reducing the expenditure as much as he possibly can, inasmuch as if the funds at the disposal of the Committee for Valencia were not sufficient, the establishment must be curtailed.

* Supported by tolls collected by Board of Trade.

Resolved—That it is very desirable that a statement of Expenditure and Liabilities be laid quarterly before the Committee, and that Mr. Spottiswoode be requested to report on the subject.

Mr Scott submitted proofs of “Instructions for Meteorological Telegraphy” and of the “Fishery Barometer Manual,” ordered to be put into type on the 15th ult. (See Minutes, p. 43.)

Resolved—That the “Instructions” be printed. The proofs of the “Manual” were ordered to be sent to the members of Committee for examination previous to their being printed.

The Committee then adjourned to Monday, July 20, at 3 p.m.

METEOROLOGICAL COMMITTEE.

2, Parliament Street, Monday, July 20, 1868.

PRESENT :

General Sabine in the Chair.

Mr. Galton.

|
Dr. W. A. Miller.

Mr. Spottiswoode.

The Director was in attendance.

The Minutes of last meeting were read and confirmed.

Mr. Spottiswoode submitted a form on which the expenditure should be entered, at regular intervals, under its different heads corresponding to those in the audited balance sheet of the office for the year 1867-8.

Resolved—That the Director be instructed to bring before the Committee, quarterly, a statement of expenditure prepared on the form proposed by Mr. Spottiswoode, and that it be accompanied by a statement of the entire amounts of all outstanding liabilities of the office. These statements to be entered on the Minutes.

Resolved—That no liabilities for expenditure exceeding 2*l.* be incurred without the sanction of the Committee.

Read letter from Rev. C. Clouston, Sandwick Manse, Orkney, requesting that the Committee would pay the sum of 10*l.* for the care of the anemometer in his charge for the year ending March 31, 1868.

Mr. Scott stated that Mr. Clouston having applied for payment for the care of the anemometer since it was first erected at Sandwick Manse, he had referred the matter to the Board of Trade, as he had found from papers in the office that Admiral Fitzroy had promised to make some allowance to Mr. Clouston, although the sum to be allowed had never been fixed. The Treasury at the request of the Board of Trade had authorized the payment of the sum of 55*l.*, being the amount due up to April 1, 1867, at the rate of 20*l.* for the first year and 10*l.* per annum for the remainder of the time that the Meteorological Office had been under the management of the Board of Trade. He submitted that the Committee would accordingly be responsible for all expenses connected with this anemometer subsequent to April 1, 1867.

Resolved—That the sum of 10*l.* be paid to Mr. Clouston for the year ending March 31, 1868, and that Mr. Scott be instructed to inform Mr. Clouston that he will receive further communications from the Committee as to whether they wish the observations to be continued after March 31, 1869, being the close of the present financial year.

Read—Letter from Professor Thomson to Secretary respecting an application made to him by the Deputy-Inspector General of the Army Medical Department in Edinburgh, that he should furnish reports from the Observatory of Aberdeen to the Army Medical Department in lieu of the observations made at Aberdeen by their own officers.

Consideration postponed.

The proofs of the Fishery Barometer Manual having been brought before the Committee,

Resolved—That it is inexpedient to republish the work in its present form, and that it be entirely re-written.

Mr. Scott reported that since the meeting of the 1st June applications for Telegraphic Weather intelligence have been received from the following places :—

Stonehaven,	Weston-super-Mare,
Filey,	Gorey (Jersey),
Whitehaven,	Dover,
Redcar,	Lytham,
Withernsea,	Dungarvan,
Harwich,	Rye,
Penzance,	Lowestoft,
Nairn,	Whitby,

and also that the following places, having been approved by the Board of Trade, have, since that date, been placed on the list of stations warned :—

Stonehaven,	Weston-super-Mare,
Filey,	Gorey,
Whitehaven,	Redcar,
Lytham,	Withernsea,
Whitby,	Nairn.
Penzance,	

The following cheques were drawn :—

For Salaries:—	£	s.	d.	£	s.	d.
R. H. Scott	-	-	-	66	13	4
H. Toynbee	-	-	-	33	6	8
B. Stewart	-	-	-	33	6	8
W. Salmon	-	-	-	17	10	0
J. S. Harding, junr.	-	-	-	13	6	8
*R. Strachan	-	-	-	15	16	8
F. Gaster	-	-	-	9	3	4
C. Harding	-	-	-	8	6	8
R. H. Curtis	-	-	-	6	19	2
†J. S. Harding, senr.	-	-	-	6	0	0
†G. White	-	-	-	7	13	10
Rev. T. Kerr (Valencia)	-	-	-			
					218	3 0
					20	16 8
Accounts, &c. :—						
Rev. C. Clouston (care of anemometer)	-	10	0 0			
J. Driscoll, half year's rent of Observatory, Valencia	- - -	25	0 0			
Rev. T. Kerr, additional outfit for Obser- vatory, Valencia	- - -	25	0 0			
R. H. Scott, office and travelling expenses		50	0 0			
					110	0 0
Total	-				348	19 8

* Including extra allowance for care of instruments.

† For four weeks.

The Committee then adjourned until Monday, August 3.

METEOROLOGICAL COMMITTEE.

2, Parliament Street, Monday, August 3, 1868.

PRESENT :

The Hydrographer in the Chair.

Mr. Gassiot.

The Director and the Secretary to the Committee were in attendance.

Mr. Scott reported that he had seen Professor Thomson, of Aberdeen, with reference to his letter of 10th July, requesting permission to furnish the Army Medical Department with meteorological information, and that he had suggested to Professor Thomson that arrangements could be made to furnish this information.

Mr. Scott presented the following report of his visit to the stations in the North of England and Scotland:—

REPORT.

GENTLEMEN,

I HAVE the honour to report that I have just returned from inspecting the stations situated in the north of England and Scotland.

Scarborough, visited July 23.—The instruments have been removed from their former situation. The barometers are in the Town Office, adjacent to the Grand Hotel, and the thermometers are suspended on an adjacent wall, with a free north aspect. The instruments are in very good order.

North Shields, visited July 24.—The thermometers and rain gauge have been removed from the office to Mr. Allaway's residence; this is a very great improvement. The instruments are in good order, but I found that Mr. Allaway had not taken the bearings by which he reported the wind quite correctly: this is now set right.

Leith, visited July 25.—The barometers are at the office, but the thermometers and rain gauge have been removed to the site on the Links, which was so liberally granted for them by the Town Council. They are now well kept, but the distance at which the Links lie from the office renders it entirely impossible that the observations should all be taken at 8 A.M.

I see no prospect of improving them in this respect, nor of obtaining good reports of sea disturbance. In other respects matters are satisfactory, and the instruments in good order.

Aberdeen, visited July 29.—The instruments are in the same position as that in which I found them last year, and are in very good order. Mr. Gibson, the Superintendent of the district, who has the charge of the instruments, has during the past winter rendered very useful services to the office by sending extra reports, and the station is altogether satisfactory.

Nairn.—Mr. Penny, the observer, was at Aberdeen, and as he did not intend to return to Nairn until the end of the week, I did not visit the station, but had a conversation with him as to his reports. I had found the state of his instruments last year so good that I did not consider it necessary to wait two or three days for him at Nairn.

Ardrossan.—The condition of this station is very good, and shows a marked improvement on the state of affairs which I found in existence last year. The clerk in charge, Mr. M'Neile, who has replaced Mr. Love, is very intelligent, and anxious to report correctly.

The thermometers are no longer under the roof of the station, but are in a garden on the premises. All the instruments are in good order.

In consideration of the great distance from the office at which the thermometers and rain gauge at Leith are placed, I would ask the sanction of the Committee to an increase of 2s. per week in the allowance to the clerk, who now gets only 3s. per week.

At Leith and Ardrossan the thermometers have been placed in boxes similar to those in use at the stations of the Scottish Meteorological Society, which were originally devised by Mr. Thomas Stevenson, C.E.

I have taken with me the new "Instructions for Meteorological Telegraphy," and also the form of "Register," which is to be issued, in future, to observers in order to render the observations taken by them more regular in form, &c., and to methodize the system of reporting. These books have been received by the observers most willingly, and the register especially has been gladly welcomed.

Before concluding this report I have to state that there is now telegraphic communication with Oban, and that the Electric Telegraph Company will have a line to Wick within the space of a month or six weeks. It is expected that this latter line will be extended to Thurso speedily.

I need scarcely say how valuable reports from such distant stations would be, if the Committee thought themselves justified in incurring the expense of the establishment of one of them, for instance,

A a

Wick, as a temporary station until Thurso should have been established as a station, when it might take the place of Wick.

Oban is not a station of either the Magnetic or Electric Companies, but has been established by a private company, so that it could not so easily be adopted as one of our reporting stations.

ROBERT H. SCOTT.

Resolved—That Mr. Scott's report be received, and that he be requested to ascertain the exact cost of a station at Wick.

Read—A letter from the Board of Trade, asking if the Committee would be disposed to pay part of the expenses connected with a new flag-staff at Eyemouth.

Mr. Scott was instructed to reply that the amount of funds at the disposal of the Committee is so limited that they are totally unable to defray any portion of the expense incurred in the erection of the new flag-staff at Eyemouth, with the exception of the cost of 30 fathoms of rope originally stated to be requisite.

Read—An application from the Board of Trade for instruments for Sombrero Island.—Granted.

Read—An application from the Pacific Steam Navigation Company for meteorological information relative to the west coast of South America.

Resolved—That Mr. Scott be requested to furnish them with any information in the Office bearing upon this region, they paying expense of making extracts.

The following logs were laid before the Committee, accompanied with remarks by Captain Toynbee :—

Capt. Henderson's Log, barque Hope, Shields to Shanghai.

No. 2368 *Log* is brought to the special notice of the Committee on account of its *excellent table of deviations*, showing the remarkable effect of change in geographical position on an adjusted compass in an iron ship.

Most excellent two-hourly observations of barometer, &c., and valuable sea temperatures.

An account of a hurricane, January 2nd, 1868, which was foretold three days by his barometer diagram, which has been most neatly kept.

Excellent remarks, especially on the above-named hurricane.

No. 2369.—*Capt. Wight's log*, ship Gosforth, a most carefully kept log.

The deviation table shows how, even in a wooden ship, the deviation may amount to half a point on entering the English Channel, which frequently wrecks ships on the Channel Islands or French coast. I have frequently noticed this myself.

Resolved—That the Director return the thanks of the Committee to Captains Henderson and Wight for their excellent logs.

At Captain Richards' request, it was resolved that these logs should be sent to his office.

Read—An application from the Panama and New Zealand Steam Packet Company, that the coaling agent at Opara should be supplied with a set of instruments.—Granted.

Resolved—That the sum of 15*l.* per annum, for the present financial year, be granted to the Rev. Dr. Robinson, of Armagh, to procure the services of a boy for the observatory, to take date from 1st May last.

The Secretary submitted the following account of a visit which he had paid to the observatories of Stonyhurst, Glasgow, and Aberdeen :—

STONYHURST.

I arrived at Stonyhurst on Monday, 13th July.

The latitude of this station is $53^{\circ} 50' 40''$ N., and the longitude $2^{\circ} 28' 10'' 2$ W. Its situation is well exposed, especially towards the N.E. and S.W.; the soil of the neighbourhood is stiff clay, and retains rain.

The *anemograph* is freely exposed, and is properly set by means of a north mark. The direction pencil is not quite perfect, but not sufficiently wrong to require alteration. The velocity pencil is quite right. In other respects this instrument appears to be satisfactory.

The *barograph* is in the same room with the magnetographs. Being wholly below the soil, the daily range of temperature in this room is very small. The standard barometer to which the observations are referred is in the same room as the barograph. It was made by Adie, and its tube has the same diameter as the barograph barometer. The height of the cistern of the standard barometer above the level of the sea has been ascertained by Mr. Sidgreaves to be 360.7 feet. This determination has reference to the Ordnance Survey, and the level referred to is, therefore, the mean sea level at Liverpool.

Mr. Sidgreaves has been in the habit of adopting an easy method of checking the accuracy of his barograph calculations as far as large errors are concerned, which will be elsewhere described.

The *thermograph* is well exposed outside, being attached to a side of the small observatory which nearly fronts the north. The bulbs are seven feet above the ground.

I should not suggest any alteration in the outer casing which surrounds the bulbs. The thermograph wet bulb thermometer was scarcely wet enough when I saw it, and in consequence an additional thread was attached to it; it appears to have gone quite right since, Mr. Sidgreaves has made an

ingenious addition to the indoor part of this instrument, consisting of a bell, which is made to ring 15 seconds before the observer reads the standard, in order to warn him to be in readiness.

The *rain gauge* is well exposed, its aperture is 1·2 feet above the ground. It is a cylinder with a funnel presenting a collecting surface of 100 square inches. The quantity is registered at 9 a.m. and 9 p.m., with a cylindrical cubic inch glass measure.

In the reports sent to Kew the whole rain which occurs between 9 a.m. of one day and 9 a.m. of the next day is entered as the rainfall for the first of these two days.

In the matter of *photography* Mr. Sidgreaves has introduced some changes which would appear to be improvements. The most notable of these is the substitution of an aqueous for an alcoholic solution of gallic acid in developing, used in the proportion of 2 drs. to 20 oz. of the rest of the solution, and the addition of a few drops of chloride of gold to the fixing bath, in order to tone the curves.

GLASGOW.

I arrived at Glasgow on Friday, 17th July.

The latitude of the observatory is $55^{\circ} 52' 43''$ and its longitude $4^{\circ} 17' 30''$ W. It is freely exposed, particularly to the S.W., standing on a height with the ground sloping downwards on all sides; the soil near it is stiff clay and retains the rain.

The *anemograph* is well exposed being erected above the centre of the dome. It has no appreciable error of setting, and the direction and velocity pencils are very nearly right. In other respects this instrument appears to be satisfactory.

The *barograph* is placed in the new equatorial observatory contiguous to the main building. It appears to be in good working order. The standard barometer to which it is referred is in the main building about 40 feet distant from the barograph barometer. The internal diameter of the tube of the standard is two-fifths of an inch, and the height of its cistern above the level of the sea is 184 feet. This determination has reference to the Ordnance Survey, and the sea level is therefore the mean sea level at Liverpool.

The *thermograph* is also placed in the new equatorial observatory. It appears to be in good working order. The external part has a northern exposure. I should not suggest any alteration to the wooden casing which contains the bulbs.

The bulbs are 7 feet from the ground and the outside exposure is tolerably good. The wet bulbs appeared to be both in good action.

The *rain gauge* is well exposed, being situated in the centre of a field immediately contiguous to the observatory. Its funnel is one inch above the ground, and the collecting surface is 5 inches in diameter. In the returns sent to Kew the rain which falls between 10 a.m. of one day and the same hour of the next day is put as the rainfall due to the first of these days.

ABERDEEN.

I arrived at Aberdeen on Saturday, 18th July.

The observatory is attached to King's College, its latitude is $57^{\circ} 9' 51\cdot3''$ and its longitude, $2^{\circ} 5' 59\cdot6''$. It is freely exposed, being near the sea on the east; the ground in the neighbourhood is of a light sandy nature.

The *anemograph* is well exposed, being put on the top of Cromwell's tower; it has no appreciable error of setting, and the direction and velocity pencils are nearly right. In other respects the instrument appears to be satisfactory.

The *barograph* appears to be in good working order. The standard barometer to which its readings are referred is in the same room with it, and both barometers have as nearly as possible the same bore. The height of the cistern of the standard barometer above the level of the sea is $88\frac{1}{2}$ feet. This determination has reference to the Ordnance Survey, and the sea-level is therefore the mean sea-level at Liverpool.

The *thermograph* appears to be in good working order. The external part has a northern exposure. It is freely exposed towards the east, but not so much so towards the west. The bulbs of the external thermometers are 41 feet from the ground. The early sun in Midsummer shines somewhat upon the boarding of the thermometer case, but I should not recommend that the bulbs should be more shut in than they are at present. As it stands the exposure is a fair one.

The standard wet bulb appeared to be somewhat too dry when I saw it, and an additional strand of thread was in consequence added. As the action still continued deficient, Professor Thomson has since taken off the old muslin bags, washed them thoroughly, and replaced them. He has also added a glass syphon, into the external branch of which are thrust the ends of the two cotton feeders. With these alterations the results have been quite satisfactory for some days past.

Professor Thomson proposes that in tabulating from the thermograph curves the glass tabulating instrument should be set by the night readings instead of those at 10 a.m. and noon, the former being less liable to be influenced by fluctuations than the latter; this would appear to be an improvement.

Mr. Stewart stated that he was preparing a report regarding the progress made in tabulating from the curves of the various instruments for the first half of this year.

Resolved—That this report when complete be printed in the Minutes, and that the Kew Committee be requested to report to this Committee "On the best method of insuring accuracy in the numerical values obtained from the records of the self-recording meteorological instruments."

Mr. Stewart reported that the barograph tabulating instrument which the Committee had authorized him to get made for Kew (see Minutes, April 20, 1868) had both diminished the labour and increased the accuracy of the results. He also stated that if

the Committee should authorize him to procure similar instruments for Glasgow and Stonyhurst he believed that he might purchase the old instruments, costing 5*l.* 12*s.* each, on behalf of the Kew Committee.

Resolved—That Mr. Stewart be authorized to get those instruments made for Glasgow and Stonyhurst, at the cost of 10*l.* 12*s.* each instrument.

Resolved—That Mr. Stewart be authorized to obtain as soon as possible a thermograph tabulating instrument for Valencia and a duplicate of it for Kew.

Resolved—That Mr. Stewart be authorized to obtain a set of copies of the various thermograph tabulating instruments (cost 2*l.* 4*s.* each), and that he also obtain a barograph tabulating instrument (original pattern), cost 5*l.* 12*s.*, and an anemograph tabulating instrument, cost 10*s.*; these to be deposited at the Central Office for the purpose of occasional comparison.

Mr. Stewart reported the observatory at Valencia was now in readiness to observe.

The following cheques were drawn:—

B. Stewart for Kew Committee :—				£	s.	d.	£	s.	d.
G. M. Whipple, visit to Falmouth				-	-	18	0	0	
Verifications of instruments				-	-	18	0	0	
" " (Admiralty)				-	-	20	10	0	
Allowance to Normal Observatory (six months)				-	-	185	0	0	
Postage to 1st August				-	-	11	14	11	
							253	4	11
Allowance to Observatories (three months) :—									
R. Grant, Glasgow				-	-	-	62	10	0
W. P. Dymond, Falmouth				-	-	-	62	10	0
D. Thomson, Aberdeen				-	-	-	62	10	0
W. Sidgreaves, Stonyhurst				-	-	-	50	0	0
Rev. T. Kerr, freight of instruments				-	-	-	15	0	0
" " fare to Valencia				-	-	-	6	1	6
B. Stewart, travelling				-	-	-	14	17	3
R. W. Munro, tabulating instrument				-	-	-	10	12	0
H. Weaver, Electric Telegraph Co., May				-	-	47	19	0	
" " " June				-	-	39	14	2	
" " " special charges				-	-	16	15	3	
							104	8	5
J. Leyland, Magnetic Co., June				-	-	-	47	0	7
S. M. Clare, Submarine Co. "				-	-	-	34	13	8
Hill & Price, Bristol agents				-	-	-	12	10	0
Negretti & Zambra, instruments				-	-	7	7	0	
" " (Admiralty)				-	-	5	12	3	
							12	19	3
F. Pastorelli				-	-	-	5	16	0
E. Higgs, carpenter				-	-	-	5	13	0
S. King, books				-	-	4	16	4	
" " (Valencia)				-	-	0	19	0	
							5	15	4
J. S. Harding, jun., office expenses				-	-	-	10	0	0
Total							£776	1	11

The Committee then adjourned.

METEOROLOGICAL COMMITTEE.

2, Parliament Street, Monday, October 12, 1868.

PRESENT :

General Sabine in the Chair.

Mr. Gassiot.

The Hydrographer.

Dr. W. A. Miller.

The Director was in attendance.

The Minutes of the last two meetings were read and confirmed.

The Director presented the following Report of his inspection of the Irish telegraph stations, which was ordered to be printed :—

Oct. 5, 1868.

I HAVE the honour to report that I have just completed my inspection of the Irish stations, as well as of Holyhead and Liverpool.

Greencastle, visited Sept. 11.—The clerk, Mr. Kelly, was absent on leave, his place being taken by his brother. The instruments were in good order, with the exception of the wet bulb thermometer, which was too much swathed in muslin. The station is otherwise in a good condition.

Valencia, visited Sept. 23.—The clerk is Miss O'Sullivan, sister to the former clerk, he having been appointed assistant to Mr. Kerr at the observatory. She is able to read the instruments correctly, and takes great care in making her observations as directed. The report of wind force is furnished to her by her brothers.

The condition of the instruments is good as regards cleanliness, but the exposure of the thermometers is not satisfactory. The telegraph office is now situated in the street of Knightstown, and a thoroughly satisfactory position for the thermometers does not seem to be obtainable.

Cape Clear, visited Sept. 28.—I was detained three days at Schull waiting until the sea was calm enough for the coastguard boat to cross to the island.

The clerk at present is Mr. O'Brien, who has replaced Shipsey, but for the future the observations will be made by Mr. Griffin, the schoolmaster. The instruments are at the school-house, and accordingly the proposed change will be a great improvement. The instruments are in good order, with the exception of the wet bulb thermometer, which was dirty, as the water with which it was supplied contained vegetable matter. This has been set right. The station is not well situated for correct wind reports, as noticed last year.

Mr. Griffin is able to read the instruments correctly, and will, I hope, make a good observer.

Roche's Point, visited Sept. 29.—The clerk is Mr. Kennedy. This station is in very good order, as the clerk has taken great interest in keeping his register, &c. ever since he was visited last year, and as he is entirely occupied in reporting ships' messages, he has naturally very good opportunities for observing the weather constantly. The whole state of things at Roche's Point is very satisfactory.

Holyhead, visited Oct. 1.—The clerk is Mr. Andrews. The instruments were in good order, and the observer very attentive to them. The thermometers are now well placed, the change of situation noticed in my report of last year having been carried out.

The telegraph office at Holyhead is situated at some distance from the sea, as reported last year, and accordingly no information as to sea disturbance can be furnished by the clerk. If it meets your approval, I shall endeavour to make arrangements to have this important defect in the Holyhead reports remedied. Admiral Schomberg, the harbour-master, has kindly promised to give me all the assistance in his power towards this object.

Liverpool, visited Oct. 2.—The clerk is Mr. Jones. The instruments are in fair order, but their situation is not favourable. The telegraph office is situated in a low temporary building surrounded by high houses. The exposure of the thermometers and rain gauge is not very satisfactory. The wind reports are furnished by Mr. Jones from observations taken at his own residence.

Mr. Jones appears to be very careful, and anxious to report correctly.

In conclusion, I would beg to make some remarks on the condition of the stations generally.

I have this year visited every station except Nairn (for the reason mentioned in my report of August 3rd). The situation and condition of the instruments is much improved, and those of the observers who were visited last year have taken care to remedy the defects in their observations which were pointed out to them, and which arose in most cases from their being to a great extent self-taught observers.

At best, however, I fear that under our present system the reports can scarcely be expected to possess much scientific value. The amount of remuneration which the office is able to allow for the duty of observing is in most cases only 5s. per week, in others only 3s. per week. For this sum it is

not possible to secure the services of observers who will be always on the watch for changes of weather, even if their duties as telegraphic clerks left them sufficient spare time to make frequent observations.

It is almost impossible to ensure that the observations should all be made at the same hour. The morning observations should be made at 8 o'clock, but as the work of the telegraphic companies at many stations does not commence till 9 o'clock, the clerks cannot be depended on to be at their stations, situated often more than half a mile from their houses, at 8 a.m. daily in all weathers, when they have no other duties, beyond observing for this office, to perform there until 9 o'clock.

If the hour were changed to 9, it is doubtful if the reports would arrive in London in time for the issue of the morning weather report at 11.15.

ROBERT H. SCOTT.

Read—Letter from Mr. D. Milne Home, dated August 11, 1868, requesting that the Committee would reconsider their resolution respecting the payment for the flag-staff at Eyemouth. See Minutes (p. 60).

The Director was instructed to refer Mr. M. Home to the report received by the Committee from the chief boatman of coastguard at Burnmouth, dated March 7, 1868, stating that the former flag-staff at Eyemouth was still in existence, and required only 30 fathoms of rope to be supplied to be efficient. The Committee sanctioned the supply of the rope. If further expenses have been incurred, they have been wholly unauthorized by the Committee, who have no available funds from which to defray them.

Read—The following letter from the Foreign Office :—

SIR,

Foreign Office, October 6, 1868.

I AM directed by Lord Stanley to transmit to you, for the information of the Meteorological Department, a despatch from Her Majesty's Consul-General in Borneo, giving an account of the observations there made on the late eclipse of the sun, and I am to request that such publicity may be given to this document as may seem to be desirable. I have further to request that Mr. Hennessy's despatch may be returned to this office when done with.

The Secretary to the Meteorological Department.

I am, &c.
(Signed) E. C. ECERTON.

The Director reported that he had at once caused a copy of the despatch referred to to be made, and had handed it to the Chairman for publication in the Proceedings of the Royal Society, if thought by the Council of that body to be of sufficient value to appear in that publication.—Approved.

Read—Applications for the loan of fishery barometers to Killybegs, County Donegal, and to Blennerville, County Kerry.—Application from Killybegs was complied with; that from Blennerville was refused.

Read—Letter from Coastguard Officer, at Lytham Station, requesting that two barometers now in his charge should be erected in two localities at that place.

Resolved—That this request be granted, in consideration of the risk attending the removal of the instruments to London.

Read—An application from the Secretary to the Local Marine Board, Aberdeen, recommending Mr. J. R. Jones as a candidate for the situation of agent for the Office at that port, vacant by the death of Mr. R. A. Gray.—Consideration postponed.

The Director stated that Captain Toynbee had requested him to submit the following registers to the Committee in consequence of their excellence :—

No. 2381.—Capt. P. F. Shortland, H.M.'s surveying ship "Hydra." (Kept by Mr. Hayward, paymaster.) Specially noticed for the observations of temperature and density taken in making deep-sea soundings.

No. 2382.—Capt. R. C. Mayne, H.M.'s surveying ship "Nassau." (Kept by Lieut. D. Tandy.) Noticed for general excellence and care taken throughout.

No. 2380.—A meteorological register kept on land by Dr. W. J. Haran, at Somerset, Cape York, Queensland, during the years 1865–66, and part of 1867.

The Director was instructed to express to Captains Shortland and Mayne and to Dr. Haran the approval of the Committee, and their thanks for the great care taken in keeping the registers.

No. 2392.—Kept by Mr. S. W. Hodding, of the Peninsular and Oriental Company's sailing ship "Indus." (See Minutes, 1867, p. 78.) Specially noticed for general excellence, for a most carefully kept table of magnetic deviation, and for a very complete account of a gale experienced off the Cape of Good Hope.

The Director was instructed to express to Mr. Hodding the gratification which the Committee had felt in examining his register.

Read—Letter from Captain J. A. Martyn, S.S. "Siberia," British and North American Steamship Company, describing the mode adopted by him to obtain the temperature and density of sea water at different depths.—Approved.

The Director was instructed to request the respective authorities at London, Liverpool, and North Shields to furnish the Committee with reports as to the weather semaphores on trial at those ports, inasmuch as the period for which they were originally erected "on trial" has long since elapsed.

Read—Letter from the Secretary to the Admiralty, submitting a notice of a new form of aneroid barometer invented by M. Baudet, of Paris.

The Director submitted a new form of self-registering metallic thermometer, devised by Messrs. Hermann and Pfister, of Bern, Switzerland.

The Director submitted a report of the work done in the Office during the half year just elapsed, which was ordered to be printed.

REPORT.

GENTLEMEN,

As six months of the financial year have now elapsed, I beg to submit the following short statement of the work done in the office since March last:—

Ocean Meteorology.—The charts of sea temperature for the South Atlantic Ocean, prepared from the data left by Admiral Fitz Roy, and from those printed by the Meteorological Institute of the Netherlands, have been lithographed, and are ready for publication as soon as the introduction has been written. The data for wind charts for the entire Atlantic Ocean have been printed in a tabular form, and, like the temperature charts, only await the introduction.

The meteorological data for the Pacific Ocean are in process of discussion, such time being devoted to them as can be spared from other work.

The extraction of data for the portion of the Atlantic Ocean now under discussion has been steadily carried on. As regards the quality of the logs in the office, Captain Toynbee has kindly furnished me with a special report, which I here subjoin.

"SIR,

Meteorological Office, October 9, 1868.

"IN accordance with your suggestion, I beg to report for the information of the Committee, that out of 271 logs of ships passing through that part of the sea for which we are extracting data, I have been obliged to reject 130 as not sufficiently trustworthy, making the proportion to be about 48 per cent. rejected.

"The above proportion is obtained from a certain number of logs on which I have made special notes, but so far as I can judge, it is a fair proportion for all the old logs lying in this office.

"I remain, &c.,

(Signed) "HENRY TOYNBEE,
Marine Superintendent."

"R. H. Scott, Esq., Director.

It is, however, right to remark that Captain Toynbee tells me that the quality of the information contained in the Registers which are now being sent in, is far superior to that contained in the old registers. As to the rate at which the actual extraction is progressing, 139 logs have been exhausted for the district under discussion, and the work is progressing steadily, at a rate somewhat more rapid than that mentioned in the annual report.

The work of inquiry into the disposal of the instruments outstanding on the books of the office has been carried on, and several instruments have thus been traced and recovered, while others have been proved to have been lost, and have been written off accordingly. As regards the future supply of instruments, the question of the construction of the hydrometers and the deep sea thermometers at present used, has come under consideration, and it seems probable that the conditions of the contracts under which the former are made will require revision.

Telegraphic Weather Intelligence.—No change whatever has been made in the working of this branch since last March.

No decision has been arrived at about the semaphores, which are still on trial at Blackwall, Liverpool, and at North Shields.

The drum signals are hoisted at 92 stations on the coast.

The telegraphic reporting stations have all been visited, and a new set of instructions have been printed. It is hoped that by this means the service may be improved in regularity and efficiency.

I am glad to say that the Electric and Magnetic Companies have rendered every assistance in their power to the office in this most important particular.

Land Meteorology of the British Islands.—The reports furnished by the Secretary will give the necessary information as to the condition and working of the observatories.

Office work, &c.—At present the curves from most of the observatories, with their tabulations, for several months, have been received, but as yet the series is not complete. Specimens of the curves have been traced and lithographed. Copies have been distributed to the members of the Committee and to a few others, as directed by Minute of the 6th July.

ROBERT H. SCOTT, Director.

The Director reported that Mr. Goodwin White had resigned his appointment as clerk on the 28th September, and he was accordingly instructed to supply the place of Mr. White; salary not to exceed 80*l.* per annum.

The Director submitted the following statement, pursuant to resolutions of Committee dated July 20, 1868 :—

ACCOUNTS PAID, AND LIABILITIES.

	Paid.	Salaries and accounts unpaid, now presented.	Estimated Liabilities.
	£ s. d.	£ s. d.	£ s. d.
Salaries - - - -	1,094 3 5	221 10 0	— — —
Instruments, Mercantile Marine - -	25 7 0	51 13 0	23 1 8
„ Admiralty - - - -	96 13 9	51 5 6	67 0 0
Agencies at Ports - - - -	18 14 8	18 3 3	— — —
Travelling - - - -	60 14 3	39 15 9	— — —
Telegraphy - - - -	672 5 6	288 9 10	174 9 9
Observatories, Current Expenses -	585 17 9	366 12 5	23 11 5
„ Outfit - - - -	323 8 10	5 12 6	146 13 3
Special Printing - - - -	18 9 4	22 10 0	— — —
Contingencies - - - -	120 16 11	9 17 4	25 18 0
Totals - - - -	3,016 11 5	1,075 9 7	460 14 1

Grand total - 4,552*l.* 15*s.* 1*d.*

Correct to October 12, 1868.

ROBERT H. SCOTT, Director.

Mr. Scott reported that on the 7th September, there being on that day no meeting, he had, on the signature of Captain Richards, drawn 1,000*l.* from the London and Westminster Bank, and placed it in the Bank of England, to meet current expenses. He also reported that the following cheques were drawn on the same day by Captain Richards :—

For salaries for August :—

	£ s. d.	£ s. d.
R. H. Scott - - - -	66 13 4	
H. Toynbee - - - -	33 6 8	
B. Stewart - - - -	33 6 8	
W. Salmon - - - -	17 10 0	
J. S. Harding, jun. - - - -	13 6 8	
R. Strachan - - - -	†15 16 8	
F. Gaster - - - -	9 3 4	
C. Harding - - - -	8 6 8	
R. H. Curtis - - - -	6 19 2	
J. S. Harding, sen. - - - -	†6 0 0	
G. White - - - -	†7 13 10	
		218 3 0
T. Kerr (Valencia) - - - -	- - -	20 16 8
J. S. Harding, jun. (office expenses) - - - -	- - -	35 0 0
		<u>£273 19 8</u>

Resolved—That the sum of 1,500*l.* be drawn from the deposit account and lodged to the current account in the Bank of England.

The following cheques were drawn :—

*For salaries for September :—

	£ s. d.
R. H. Scott - - - -	66 13 4
H. Toynbee - - - -	33 6 8
B. Stewart - - - -	33 6 8
W. Salmon - - - -	17 10 0
J. S. Harding, jun. - - - -	13 6 8
R. Strachan - - - -	†15 16 8
F. Gaster - - - -	9 3 4
C. Harding - - - -	8 6 8
R. H. Curtis - - - -	6 19 2
J. S. Harding, sen. - - - -	§7 15 0
G. White - - - -	9 5 10

* Drawn by Captain Richards, October 6th.

† With extra allowance for instruments.

§ For five weeks.

† For four weeks.

|| To September 28.

Allowances to observatories:—

	£	s.	d.
T. Kerr, Valencia	*20	16	8
" " current expenses	52	0	9
W. P. Dymond, Falmouth	62	10	0
R. Grant, Glasgow	62	10	0
T. R. Robinson, Armagh	56	5	0
W. Sidgreaves, Stonyhurst	50	0	0
D. Thomson, Aberdeen	62	10	0
Accounts, &c. :—	£	s.	d.
P. Adie, instruments	42	5	0
" " "	11	7	0
		53	12 0
L. P. Casella "	9	8	0
" " "	20	7	0
		29	15 0
Elliott Brothers, instruments		19	11 6
H. Smart, Liverpool agent		18	3 3
Electric Telegraph Co., July	43	4	2
" " August	45	15	10
" " special charges	20	15	9
		109	15 9
Magnetic Telegraph Co., July	48	12	0
" " August	52	0	10
		100	12 10
Submarine Telegraph Co., July	33	2	0
" " August	33	10	1
		66	12 1
Easton, Amos, & Co.		11	9 2
Waterlow & Sons, stationery		5	12 6
Malby & Sons, printing		22	10 0
E. Higgs, carpenter		4	17 4
C. Clouston, care of Anemometer, Orkney		5	0 0
R. H. Scott, travelling		39	15 9
		£1,075	9 7
*J. S. Harding, jun., office expenses, on account		10	0 0

* Drawn by Captain Richards, October 6th.

The Committee then adjourned.

METEOROLOGICAL COMMITTEE.

2, *Parliament Street*, Monday, October 26, 1868.

PRESENT :

General Sabine in the Chair.

Capt. Richards.

|
Dr. W. A. Miller.

Mr. Gassiot.

The Director and the Secretary to the Committee were in attendance.

The minutes of the last meeting were read and confirmed.

The Director submitted the following letter from the Scottish Meteorological Society :—

Meteorological Society of Scotland, 4, St. Andrew Square,

DEAR SIR,

October 16, 1868.

You are aware that the Council of the Scottish Meteorological Society, some months ago, addressed a memorial to the Lords Commissioners of the Treasury, praying for an annual grant from Government to aid them in carrying out more effectively the important objects for which the Society was instituted.

I presume also that you are aware of the answer which has been sent by the Lords of the Treasury.

In their answer to the Council, their Lordships twice made reference to your Committee in terms which seem to imply that your Committee and the Council of the Society might advantageously confer together and co-operate for the common objects which both have in view.

Nothing would give the Council of the Scottish Meteorological Society more pleasure than to be on such terms with your Committee, and to work together, as their Lordships suggested, for the prosecution of common objects.

Our Council, about a year ago, received from their Lordships a similar suggestion, to which, as you know, we readily responded. Shortly afterwards, Mr. Buchan, our Meteorological Secretary, gave effect to the suggestion by undertaking the investigation of some Atlantic storms, for which he obtained from your office valuable information, and I observe that in your First Report, recently published, you are kind enough to say that our Society, by undertaking this investigation, will, so far as it goes, relieve your Committee of a certain portion of the work with which it is burdened.

Our Council will be very happy to undertake any other duty which your Committee may do us the honour of entrusting to us, and for which we may feel ourselves competent, and this assurance I beg to offer in consequence of the suggestion and wish again expressed by my Lords in their recent communication.

You are well aware, however, that the revenue of our Society is not only exceedingly limited, but that it depends entirely on the voluntary annual subscriptions of its members.

Their Lordships call our attention to the circumstance that Parliament has placed at the disposal of your Committee an annual grant of 10,000*l.* for meteorological purposes, and that one of the duties which your Committee was intended to perform by means of that grant was the collecting and reducing of meteorological observations over an area embracing the whole of the British Isles, and that in pursuance of this duty, as their Lordships say, your Committee are now establishing observatories in Scotland as well as elsewhere.

Our Council desire particularly to call your attention to this statement, because, if correct, it would, we hope, be in the power of our Society to materially aid your Committee, if they should be pleased to accept our services in the collecting of meteorological observations, as far as Scotland is concerned; and if my Lords are correct in stating that this work is one of the duties intended to be undertaken by your Committee, we presume it would be quite competent and proper for your Committee to apply a portion of the annual grant of 10,000*l.* to aid the Scotch Society in collecting on behalf of your Committee the meteorological returns which are now received from the Society's stations.

The desire of the Council is to follow in all respects the suggestions and wishes of the Lords Commissioners of the Treasury, and it is solely in that spirit that I now address myself to you, and ask whether your Committee would agree to some such arrangement as I have now indicated, embracing the appropriation of a part of the 10,000*l.* grant in aid of our Society?

R. H. Scott, Esq.,
Meteorological Office.

I have, &c.
(Signed) A. KEITH JOHNSTON,
Hon. Sec.

MY LORD,

Treasury Chambers, September 21, 1868.

THE Lords Commissioners of Her Majesty's Treasury have had under consideration the memorial of the Scottish Meteorological Society, representing the claims of that Society for our annual grant from Government to aid in carrying out its object.

Their Lordships desire me to state in reply, and for the information of the Council, that when the plan of giving 10,000*l.* a year to the Committee of the Royal Society was adopted, it was with the intention, as far as Government was concerned, of concentrating in the hands of one competent and responsible body the work of collecting and reducing meteorological observations over an area embracing the whole of the British Isles, and with this object the Committee of the Royal Society have established observatories in Scotland as well as elsewhere.

Under these circumstances, my Lords feel that if the Government were to make fresh grants to separate societies or individuals over whom they have no control, they would be departing entirely from the principles on which they acted in the case of the Royal Society, and they regret, therefore, that they cannot afford to the Scottish Meteorological Society the assistance sought for in the application from the Council.

I am, however, to suggest that the Council should place themselves in communication with the Committee of the Royal Society, with a view of arriving, if possible, at an understanding with that body which would admit of the two societies working together in the prosecution of the objects they both have in view.

The President of the Scottish
Meteorological Society, Edinburgh.

I am, &c.
(Signed) WILLIAM LAW.

The following draft of a reply was read and approved :—

SIR,

I AM instructed by the Committee to acknowledge the receipt of your letter of the 16th inst., enclosing a copy of a reply to a memorial of the Scottish Meteorological Society received lately from Her Majesty's Treasury.

The Committee learn from this reply, which they had not previously seen, that my Lords have thought fit to repeat the suggestion that the Council of the Scottish Meteorological Society should work together with this Committee in the prosecution of the subjects they both have in view.

The Committee were informed by the Board of Trade, in October 1867, that a suggestion to a similar effect was made to the Scottish Meteorological Society by the Treasury at that date.

I am accordingly to inform you that it will afford this Committee the most sincere satisfaction to be able to co-operate with the Council of the Scottish Meteorological Society in any way which may seem advisable to both bodies.

The Committee, as you are aware, have, with the kind assistance of Professors Grant and Thomson, established, out of the funds at their disposal, two observatories in Scotland, viz., at Glasgow and Aberdeen, furnished with continuously self-recording instruments, and they had originally wished to have established a third at an extreme northern station, but the insufficiency of funds for the purpose has precluded the possibility of such an idea being at present entertained. Their proposed system of inquiry into the meteorological conditions of the British Isles is based on curves furnished by continuously self-recording instruments.

In addition, they have four stations on the coasts of Scotland whence they receive daily telegraphic weather reports. They are at present unable to adopt Wick, to which telegraphic communication has recently for the first time been extended, as they dare not increase their expenditure.

They have at present to make provision for the payment of the clerks who are to discuss the materials now coming in from their observatories, as will be seen by a reference to their First Report, p. 26, and accordingly they fear that they are not in a position at present to accept the proposal so freely made in your letter, of "the services of your Society in the collecting of meteorological observations, so far as Scotland is concerned." You will see that they could not invite assistance in "collecting," unless there were a prospect of the discussion proceeding *pari passu* with the accumulation of materials.

As regards Ocean Meteorology, it is in the power of your Society to afford most valuable assistance to the Committee by following the line of action adverted to in your letter, viz., by the Society undertaking to discuss some portion of the large amount of observations lying in this office.

The terms on which copies of observations can be had are doubtless already known to you, but I herewith beg to enclose a copy of them.

If the Society is willing to co-operate with the Committee on these terms, I have no doubt that very efficient aid to the cause of Ocean Meteorology can be insured by such joint action.

If the subject selected by the Society be one which would fall in with the investigations as to Ocean Meteorology carried out by this office, I am instructed to say that while the entire credit of the discussion would rest with the Society, the expense of publication would be borne by this office if necessary.

In conclusion, I have again to assure you that the wish for harmonious action is most cordially reciprocated by this Committee, but they regret that, for the reasons stated in their Report, pp. 11 and 26, it is absolutely out of their power to make any appropriation of a part of the 10,000*l.* grant, in aid of the Scottish Meteorological Society. In the year 1867-8 the grant was insufficient to meet their expenses, and although they hope that this state of things will be improved in the course of the present financial year, they will be obliged to reserve any sums which they can possibly spare for the payment of clerks to increase the staff of the office, which is quite insufficient to cope with the work at present awaiting discussion.

A. Keith Johnston, Esq.,
Hon Sec., Scottish Meteorological Society.

I have, &c.,
ROBERT H. SCOTT, Director.

The Director submitted the following letter:—

8, Henrietta Street, Cavendish Square, October 26, 1868.

THE Committee appointed by the British Association at the last meeting at Norwich being anxious to obtain surface temperatures of the sea on the western boards of Scotland, Ireland, and the south-western approaches, from the 45th parallel of north latitude towards the southern angle of the banks outlying Ireland, as well as the extreme of the British Channel,—

Request that your Board will aid its operations as it may seem most desirable, but specially to afford it from the logs of the Cunard and Southampton packets such lines as may have been collected from the parallel of 45° N. and 25° W. on the approaches towards Cape Clear on the Irish coast, and Ushant, at the Channel entrance.

The Committee would not wish to incur any expense; but if the documents have been already reduced, would extract such special data as would aid the mathematical section next year to allot such sum as it may deem fit to further prosecute their wishes.

We are, &c.,

R. H. MANNERS, Admiral.

EDW. BELCHER, Vice-Admiral.

He was instructed to reply as follows:—

SIR,

IN answer to the request of the Committee appointed by the British Association which I had the honour to submit to the Committee of this office at their meeting yesterday, I am instructed to inform you that surface temperature charts for the North Atlantic Ocean have already been published by the Royal Meteorological Institute of the Netherlands, in the work entitled "Ondersoekingen met den Zeethermometer," Utrecht, 1861. They comprise the area up to lat. 49° N. and long. 5° W.

This Committee are themselves, with a view of extending and perfecting the Dutch observations, collecting information to aid in the preparation of charts for the entire North Atlantic Ocean, on which the temperature for each square degree will be laid down.

If, in the interim, your Committee wish to have any information for immediate use, copies of the observations named in your letter, or of any others which are in this office, can be supplied on the terms laid down by this Committee, which I have the honour to subjoin.

I am further to inform you that such copies are made by the clerks in this office at extra hours, the expense being 1s. 3d. per hour.

I am, &c.,

ROBERT H. SCOTT, Director.

Admiral Manners, F.R.S.,

&c. &c. &c.

The Director submitted a letter from Capt. Toynbee, accompanying a paper of his on Isobaric curves.

Resolved—That this paper be circulated among the members of the Committee.

The Director reported that on the 20th inst. he had received a letter from Mr. D. Milne Home, requesting a remittance of the cost of the 30 fathoms of rope mentioned in the minutes of October 12, and that he had directed him to forward the account for it through the Inspecting Commander of Coastguard at Berwick.—Approved.

The Director requested instructions as to the introductions to be printed for the Sea Temperature Charts and the Wind Tables for the Atlantic Ocean respectively, as mentioned in his report presented October 12.

Resolved—That drafts be written and submitted to the members of the Committee.

The Director reported that, since the meeting of the 20th July, applications for telegraphic weather intelligence have been received from the following places:—

Galway,
Ipswich,

Howth,
Worthing,

and also that the following places, having been approved by the Board of Trade, have, since that date, been placed on the list of stations warned:—

Dungarvan,
Harwich,
Ipswich,
Howth,

Rye,
Galway,
Dover.

The Director reported that he had received from the Indian Government, through Mr. Stewart, the sum of 172*l.* 2*s.* 8*d.*, being payment for the spare Barograph, Thermograph, and Barograph Tabulating Instrument, belonging to this Committee, and that he had lodged the amount to the current account of the Committee in the Bank of England.—Approved.

The Director reported that, in accordance with the instructions of the Committee at last meeting, he had engaged Mr. F. Steventon as clerk in the place of Mr. White, at a salary of 80*l.* per annum.—Approved.

The Secretary submitted the following account of a visit which he had paid to the observatories of Falmouth, Valencia, and Armagh :—

FALMOUTH.

I arrived at Falmouth on Wednesday, 30th September.

The latitude of this station is $50^{\circ} 9' 24''$ N., and the longitude $5^{\circ} 3' 30''$ W. The observatory stands on an eminence and is well exposed.

The *anemograph* is freely exposed, being placed above a tower attached to the building. It is thus considerably higher in elevation than the tops of the neighbouring houses. The instrument was not quite correctly oriented, being about a point wrong, reading 1 when it ought to have read 0. It was put right on the forenoon of October 5th. In other respects the instrument appears to be satisfactory.

The *barograph* is in good working order; there is perhaps rather little ventilation in the room which contains it, but this is remedied by the door being left open. The standard barometer to which the observations are referred is in a room above the barograph room. Its bore is the same as that of the barograph barometer. The height of the mercury of its cistern above the mean sea-level at Liverpool has been found to be 210·8 feet.

The *thermograph* frame is attached to the north side of the observatory. It is perhaps hardly so well exposed as might be desired, there being a wall near it to the west. The situation is, however, the best that could be obtained in connexion with the building.

The height of the bulbs above the ground is about 11 feet. I requested that three additional wooden bars should be attached to the east and north sides of the case, in order to prevent radiation from the neighbouring objects.

On September 23 the dry bulb thermometer was accidentally broken, but the spare thermometer was substituted for it without affecting the accuracy of the results.

I caused new muslin coverings to be applied to the wet bulbs, as the old ones were somewhat soiled.

I also tested the standard thermometers at the freezing point, and found that there was no perceptible change in their zero since they had been tested at Kew previous to the establishment of the Falmouth Observatory.

The inside arrangements of the thermograph are quite right.

The *photography* both for the barograph and thermograph appears to be good.

There is no ground connected with the observatory on which a *rain-gauge* could with propriety be placed.

VALENCIA.

I arrived at Valencia on Thursday, 6th October.

The latitude of this station is $51^{\circ} 54' 36''$ N., and its longitude $10^{\circ} 18' 10''$ W. The ground in the neighbourhood is nearly level and retains moisture.

The *anemograph* is placed well above the roof of the observatory. The building itself is well exposed to the south-west, which is the most important quarter. The nearest elevation is towards the N.W., but altogether the exposure is good.

The instrument is properly oriented and the pencils are right. As the windmill vanes appeared to be somewhat stiff, Mr. Kerr has inspected them, and found that the wet weather had swollen the wooden bearings, so that there was not sufficient end-play. He has now remedied this defect.

The *barograph* is in good order. The standard barometer to which it is referred is in the same room with it, and the internal bores of both tubes are the same. The height of the mercury of the cistern of the standard barometer above the mean level of the sea contiguous to the observatory is 23 feet.

The *thermograph* appears to be well exposed outside, being attached to the north of the observatory. The thermometer bulbs are 12 feet above the ground. The action of the wet bulb thermometers was good.

The *photography* both for the barograph and thermograph appears to be good.

The *rain-gauge* is well exposed, its aperture being about 1 foot above the ground. Hitherto the rain read at 10 a.m. has been entered by Mr. Kerr as having fallen on that (civil) day, but from the beginning of October the rain which falls between 10 a.m. of one day and 10 a.m. of the next day will be entered as having fallen on the first of these two days. The necessary alterations will be made in the records previous to October, which are now at Kew.

ARMAGH.

I arrived at Armagh on Saturday, October 17th. The latitude of this station is $54^{\circ} 21' 13''$ N., and the longitude $6^{\circ} 38' 52''$ W. The building stands on an elevation from which the ground slopes down on all sides.

The *anemograph* is the original one devised and constructed by Dr. Robinson, and described by him in the Transactions of the Royal Irish Academy. The cups of the instrument are 3 feet above the level of the observatory equatorial dome, which is towards the S.E. of the *anemograph*.

The *barograph* is in good order. The standard barometer to which the readings are referred has the same internal bore as the barograph barometer, and is in the same room with it. The height of the cistern of the standard barometer is 207·28 feet above the mean sea level of the coast of Ireland.

The *thermograph* is attached on the outside to the north of the building. The builder who constructed the thermograph case gave it (during the illness of Dr. Robinson) a substantial leaden covering. In order to obviate the possible accumulation of heated air below this covering, a ventilating arrangement

is being made. The bulbs of the thermograph are 4 feet above the ground. Dr. Robinson has ascertained, by comparison with another thermometer, that the situation of the thermograph thermometers does not appreciably interfere with the accuracy of their readings.

The wet bulb arrangements are in good order.

The *photography* both for the barograph and thermograph is very good.

The *rain-gauge* is well exposed, its aperture being 18 inches above the ground, and 100 square inches in area.

Hitherto the rain read at 10 a.m. has been entered as having fallen on that day, but from the beginning of November the rain which falls between 10 a.m. of one day and 10 a.m. of the next day will be entered as having fallen on the first of these two days. The necessary alteration will be made in the records previous to November, which are now at Kew.

The Secretary presented the following report (ordered 3rd August 1868, see Minutes, p. 61) regarding the progress made in tabulating from the curves of the various instruments:—

REPORT to the Meteorological Committee of the Royal Society regarding the Progress made in Tabulating from the Curves of their various Self-recording Instruments for the first six months of this year.—By B. STEWART, Secretary to the Committee.

BAROGRAPH.

The results derived from this instrument are liable to have their accuracy affected by three causes:—

- (1.) By an imperfect temperature compensation.
- (2.) By a sluggish action of the mercury in the barograph tube.
- (3.) By an imperfect system of tabulation.

Temperature Compensation.—The method by which the barographs are compensated for temperature has been described in the Report of the Meteorological Committee for the year 1867. The precise position of the fulcrum of the glass rod was determined by means of some preliminary experiments made at Kew upon the first barograph. These experiments consisted in subjecting the instrument to a very considerable range of temperature artificially produced, while frequent comparison of its indications with those of a standard barometer gave the means of determining approximately what ought to be the position of the fulcrum. There was not, however, sufficient time for a very complete experiment, but I think it may be presumed that the determination arrived at cannot be wrong by more than $\frac{1}{10}$ of the whole. Assuming this to be the case, the next point is to find what is the actual temperature range at the various observatories.

The following table exhibits both the mean daily range and the maximum daily range for each month for each of the five observatories in Great Britain (excluding the two in Ireland that have been started more recently). In all these, with the exception of Stonyhurst, a night observation is taken of the barograph thermometer at 10 o'clock, but the result will show that in Stonyhurst such an observation is unnecessary.

DAILY RANGE OF TEMPERATURE IN DEGREES FAHRENHEIT, as given by the observation hours.

			Kew.		Stonyhurst.		Glasgow.		Aberdeen.		Falmouth.	
			Mean.	Max.	Mean.	Max.	Mean.	Max.	Mean.	Max.	Mean.	Max.
April	-	-	1·0	2·6	0·2	0·6	1·4	3·4	1·8	3·7	2·2	5·3
May	-	-	1·5	3·3	0·2	0·6	1·5	3·0	1·7	5·0	1·3	3·0
June	-	-	1·6	3·7	0·4	1·8	1·8	4·1	1·8	3·7	1·8	6·7

From these results it would appear that, assuming the temperature adjustment to be $\frac{1}{10}$ wrong, the greatest error introduced in any of the above observatories during the three months of April, May, and June would be about 0·0015 in., while the mean monthly error would be inappreciable in any case. Now from the system adopted in these instruments, namely, constant reference to a standard, it is clear that the range of temperature from one part of the year to another is without influence on the result obtained, and that it is only the daily range that we have to consider. But the above table shows that the daily range is so small as not to introduce any appreciable errors in the case of the English and Scotch observatories, and a smaller number of comparisons shows that the same will probably be the case for the Irish observatories.

It would thus appear that with these barographs the method of reduction now practised is sufficiently accurate to obviate the effects of changes of temperature, probably in the case of all the observatories, and that it is unnecessary to resort to that more complicated but perfect system of reduction alluded to in the annual Report, by means of which the influence of temperature may be completely eliminated. When a full year's observations have been obtained from all the observatories, it may be possible to decide whether a slight readjustment of the fulcrum of the glass rod would be desirable.

Sluggishness of Mercury.—As the barograph tube is always in perfect repose, and the action of adhesion (should such exist) is not counteracted by tapping or moving the tube, it is desirable to test the results for sluggishness of mercury.

The standard barometers to which in all cases the barographs are referred are, on the other hand, subject to motion, and although they are not tapped when read, yet they are probably sufficiently moved in the operation of reading to counteract any sluggishness of the mercury.

The Kew standard barometer is placed on the first floor of the observatory. It was constructed by Newman, and its tube is 0·550 inches in diameter. The Kew barograph barometer is placed on the basement floor; it was constructed by Adie, and its diameter is 0·500 inch.

Now four or five times each day, while the light is cut off from the recording cylinder of the barograph by the clock arrangement, the standard barometer is read. We can thus compare these standard readings with the simultaneous measurements of the barograph, these latter being of course properly tabulated, converted into true inches, and the residual correction applied as described in the Report of the Meteorological Committee for 1867. Should there be any sluggishness in the mercury of the barograph, we might expect to discover it by means of this comparison, for in such a case the barograph would lag behind, and thus read too high with a falling, but too low with a rising barometer.

If, therefore, we presume that the standard barometer is free from sluggishness, and denote its readings by S and those of the barograph by B, then $S - B$ ought in the case of sluggishness of the barograph barometer to be *negative* for a *falling* but *positive* for a *rising* barometer.

The observations of January, February, and March, taken at Kew, have been discussed in this way, and the mean result for these is that for a falling barometer $S - B = -0·00012$ in., while for a rising barometer $S - B = +0·00025$ in. These results appear to indicate a retardation in the Kew barograph barometer, but so slight as to be unworthy of notice.

The observations of January and February, taken at Stonyhurst, have been discussed in a similar manner with the following result:—For a falling barometer $S - B = +0·0008$ in., while for a rising barometer $S - B = -0·0006$ in. In this case it would appear that the barograph barometer has less retardation than the standard, but the difference is too small to be regarded. These are all the comparisons of this nature that have as yet been made. I should propose that the first year's results for all the observatories should be tested after this manner.

System of Tabulation.—The progress made in tabulating the barograms up to the date of publication of the annual Report of the Committee has been described in that Report. The first operation is to measure by the aid of a simple tabulating instrument, carrying a scale with a vernier attached to it, and capable of being read to the thousandth of an inch, the whole depth of the barogram for every hour.

This system is nevertheless laborious, implying two measurements and one subtraction for each hour, besides the application of tables of conversion, and the consequence is that there is the liability to make an occasional mistake, such being often comparatively large. This source of error was brought prominently before me on the occasion of specimens of the proposed system of publication of curves being traced at the central office.

The best remedy appears to be the use of an ivory scale having a breadth equal to one hour of the time scale, and by means of which the hourly depth of the barogram may be read to the hundredth of an inch. If these readings be compared with the readings taken independently by the tabulating instrument, any error in the latter will be at once discovered. For the errors to which the tabulated measurements are liable are such as *five hundredths of an inch* or *one-tenth of an inch*, errors of a large amount, which may easily be detected by the system of subsidiary measurement.

The following is an example of a day's comparison after this method, exhibiting an error which has thus been brought to light:—

—	Tabulated Reading from Weekly Tabulation to the nearest hundredth. A.	Reading with Ivory Scale to nearest hundredth. B.	A - B. In hundredths.
August 29. 1 a.m.	30·22	30·21	+1
" 2 "	30·22	·22	0
" 3 "	30·21	·21	0
" 4 "	30·22	·23	-1
" 5 "	30·22	·22	0
" 6 "	·23	·22	+1
" 7 "	·24	·24	0
" 8 "	·25	·25	0
" 9 "	·25	·25	0
" 10 "	·26	·26	0
" 11 "	·26	·27	-1
" Noon.	·26	·27	-1
" 1 p.m.	·25	·25	0
" 2 "	·25	·25	0
" 3 "	·26	·27	-1
" 4 "	·25	·26	-1
" 5 "	·25	·25	0
" 6 "	·24	·34	-10 Error
" 7 "	·24	·24	0
" 8 "	·24	·25	-1
" 9 "	·25	·26	-1
" 10 "	·24	·24	0
" 11 "	·24	·24	0
" Mid.	·24	·25	-1

The average number of errors in one month (brought to light by this method) is probably not more than six.

* I found on my visit to Stonyhurst that such an arrangement had been adopted by Mr. Sidgreaves from the commencement.

Although at first it is absolutely necessary to have in the case of the barograph a tabulating instrument measuring inches, in order by its means to determine the instrumental constants of each instrument, yet when once these instrumental constants have been accurately determined it has been found serviceable to replace the tabulating instrument by another, which by means of the known values of the instrumental constants gives the true pressure in one measurement, instead of requiring two measurements, one subtraction and one conversion.

An instrument of this nature was obtained for the Kew barograms by way of experiment, and the month of June has been tabulated by its means. The labour of tabulation is greatly reduced and the accuracy of the result considerably increased.

A subsidiary ivory scale is applicable here as in the case of the first tabulating instrument, and it is found that on applying it there are fewer errors made, the monthly average of six errors being reduced to two or three. It is proposed that this second form of tabulating instrument should be used for the other observatories as soon as their instrumental constants are determined.

The method of subsidiary tabulations now described is of use in discovering the larger errors that the observer is liable to make when he measures the curve. But to ensure an efficient standard of correctness, it is not only necessary that the larger errors should be altogether eliminated, but smaller errors should be reduced to a minimum. Thus an observer might be sufficiently cautious in reading his scale to make no large error, yet sufficiently incautious to read erroneously when he came to the third figure of decimals.

For rough results such an observer might be reckoned a good one, but for the more delicate class of investigation his figures would be of less value.

The only way of perfectly eliminating this class of errors is for two independent observers to make separate measurements, each with a tabulating instrument, a course involving much additional labour and expense. But it is obvious that the standard barometer affords a ready approximate means of estimating the correctness of an observer's results. For should he be an incautious observer, the mean difference between the simultaneous readings of the standard and the barograph barometer will be comparatively great, but if he both observe his standard and measure his curves well the mean difference will be small.

The following table exhibits these mean differences between the barograph readings reduced and the simultaneous standard readings** for each of the observatories for each month up to the end of June :—

	Kew.	Stonyhurst.	Glasgow.	Aberdeen.*	Falmouth.*	Armagh.†
January - - -	·0027	·0032	·0067			
February - - -	·0027	·0032	·0045			
March - - -	·0028	·0025	·0039			
April - - -	·0027	·0017	·0035	·0035		
May - - -	·0025	·0031	·0036	·0032	·0042	
June - - -	·0021‡	·0021	·0036	·0029	·0029	

While the simultaneous readings of the standard and barograph barometer afford us one means of testing the correctness of the observer's measurements, they do not yet do quite enough. For an observer may unconsciously bestow a greater amount of pains upon those measurements which are simultaneous with standard readings than he does upon his other measurements, and the above differences might not therefore be a true representative of his general correctness. A certain number of measurements of the curves of each observatory is consequently made at the central observatory, and the monthly mean difference between these and the corresponding measurements by the local observer is also recorded.

The following table exhibits these mean differences in inches. (These inches apply to the curve. The differences in true inches of pressure will be less, and may be found by multiplying these by ·65.)

	Kew.	Stonyhurst.	Glasgow.	Aberdeen.	Falmouth.	Armagh.
January - - -	·0030	·0037	·0058			
February - - -	·0038	·0033	·0041			
March - - -	·0027	·0041	·0061			
April - - -	·0042	·0032	·0028	·0042		
May - - -	·0015	·0025	·0023	·0049	·0058	
June - - -	·0010‡	·0057	·0021	·0029	·0042	

Up to June 30, 12 monthly measurements have been made for each observatory, but in future it is proposed that the number be increased to 48.

* Aberdeen was not in action before 1st April, nor Falmouth before 1st May.
† The instrumental constants for the Armagh barograph have not yet been sufficiently well determined.
‡ The small mean differences for Kew for June show probably the superiority of the second tabulating instrument.
** The standard readings are entered in the journals uncorrected and unreduced, the temperature being given. The accuracy with which these are corrected for index error and reduced to 32° is occasionally tested.

The prominent features of the method of examining barograph results have now been described. These consist, in the first place, of a method of eliminating occasional large errors by subsidiary tabulations, and, in the second place, of a system by means of which a monthly estimate of the correctness of each observer is kept, and the results communicated to the observer.

In concluding this part of the Report, I ought to point out the difference between the application of the system of subsidiary tabulations as regards the two kinds of tabulating instruments.

Before the instrumental constants have been well determined, it is necessary (as has already been shown) to have a tabulating instrument which measures inches, and of course the ivory scale, which is merely a simple form of tabulating instrument, will measure inches also. By means of these two scales we may confidently suppose that the depth of the barogram space for each hour has been correctly measured, and these measurements are then converted into true inches by means of a table of conversion. Finally a residual correction is applied to each reading.

No check has, however, in this process tested the accuracy with which this table (supposed correct) is used during conversion, so that even supposing that a measurement is right, yet if its wrong equivalent is read out from the table, or if the residual correction is erroneously applied, the final result will be erroneous.

But as soon as the instrumental constants have been well determined, it is possible to construct both a tabulating instrument and an ivory scale that will read off at once the true pressure as the result of a measurement, and thereby render us quite independent of a table of conversion, although it will not test the accuracy with which the residual correction is applied.

To sum up. It would appear, (1.) That in the case of the barograph barometers belonging to Kew and Stonyhurst, there is no appreciable retardation, but similar experiments require to be made for the other instruments.

(2.) The temperature adjustment is sufficiently complete for all purposes.

(3.) The mean difference between simultaneous readings of the barograph and standard barometers may probably be reduced to 0.002 in., and this may not ultimately prove to be greater than the mean difference of two observers measuring the same curve. The system of tabulation would thus appear to be as good as is required.

THERMOGRAPH.

The accuracy of the thermograph results is liable to be deranged by three causes:—

- (1.) By a cause depending on the situation and exposure of the instrument.
- (2.) By instrumental deficiencies, and especially the arrangements connected with the wet bulb.
- (3.) By a deficient system of tabulation.

Situation of Instruments.—In the report of the Meteorological Committee for 1867, the influence of local peculiarities was alluded to, and the result of simultaneous comparisons made at Kew between the readings of two sets of dry and wet bulbs was given for the month of February; one of these sets being placed in a frame detached from the main building of the observatory, and the thermometers having very small bulbs; the other set being the wet and dry-bulb standard thermometers of the thermograph frame. This result seemed to indicate that the local peculiarity of either frame was comparatively small, the mean and maximum differences, irrespective of sign, between the dry bulb readings being $0^{\circ}22$, $0^{\circ}7$, while those between the wet bulb readings were $0^{\circ}2$, $0^{\circ}9$. Taking signs into account there was no residual difference between the dry bulbs for this month, while on the whole the thermograph wet bulb stood $0^{\circ}12$ higher than the other.

A similar comparison made for the month of July, gave for the dry bulb reading mean diff. $0^{\circ}58$ max. diff. $2^{\circ}9$, and for the wet bulb reading $0^{\circ}34$ max. diff. $1^{\circ}8$. Taking signs into account there was no residual difference for the month either for the dry or wet bulbs.

The differences irrespective of sign for July are thus greater than for February. I am disposed to imagine that the thermograph frame has the best situation, but I do not think that the differences can be considered great.

Dr. Robinson, of Armagh, has likewise made a similar comparison between his thermograph dry bulb thermometer, and another thermometer placed at a higher elevation, and has obtained as the result of 150 observations made during the months of April and May a mean difference irrespective of sign = $0^{\circ}9$, and a max. diff. = $3^{\circ}1$. Taking signs into account the thermograph thermometer read on the whole $0^{\circ}27$ lower than the other. While these differences are not large, Dr. Robinson is of opinion that the upper thermometer is more liable to be affected by the sun, and that the thermograph thermometer is in consequence the most correct.

No other observations have been made on the subject.

Wet Bulb Arrangements.—These are particularly liable to go wrong in frosty weather. The attention of the observers has been drawn to the subject in the following paragraph of the "*Regulations for Thermograph*:"—

"When the standards are read, the observer ought to notice if both wet bulbs are right. If both are right the sign $\checkmark$ should be made after the recorded temperature of the wet standard. If the thermograph wet bulb is wrong the sign t should be made, and if the standard wet bulb is wrong the sign s . Either wet bulb if wrong ought to be put right at once. Should it happen that the wet bulbs are frozen at the moment of observation, the present temperature being also below 32° , cold water should

be poured into the water vessel, and over the wet bulbs and the connecting strings. In a few minutes the wet bulbs will by this means be covered with a fresh coating of ice; this should be repeated if necessary. If this operation is performed two or three times a day during very cold weather, there is reason to believe that the wet bulb will always be covered with a sufficient coating of ice. But if the wet bulb and the water of the water vessel be frozen from previous cold, the present temperature being above 32° , the ice of the water vessel may be thawed by warm water, using no more than is necessary for the purpose."

In consequence of these regulations being followed during the cold months at the commencement of the year by the observatories of Kew, Glasgow, and Stonyhurst, then at work, it is believed that there are comparatively few instances in which we do not know the temperature of evaporation for these stations during frost. During dry weather the wet bulb arrangement is again liable to go wrong, although from a different cause. The thread, which in the arrangement adopted lies along a copper groove, gets dry in its passage from the water vessel to the bulb, the capillary action ceasing. Sometimes it rights itself without aid, but sometimes it continues wrong until it is put right at the next observation hour. The commencement and the termination of such a wrong state of the wet bulb are generally so clearly indicated by the curve itself, that there appears to be little or no uncertainty in ascertaining what observations ought to be rejected.

This action would best appear to be prevented by an arrangement first suggested by Professor D. Thomson, of Aberdeen, namely, the use of a bent glass tube lying along the metallic groove, and having one end dipping into the water of the water vessel, through which the thread is carried on its passage from the water vessel to the thermometer. Evaporation is thus avoided. Nevertheless the arrangement would not answer in winter, when the frost would burst the tube, but it would not then be necessary. Sometimes a bent tube of this kind will be found to carry the water too rapidly from the water vessel to the thermometer; when this is the case, lift its end out of the water for a few minutes and allow the water to drain out; when replaced it will probably work well.

System of Tabulation.—The method of tabulating from the thermograph curves has already been described in the Annual Report of the Meteorological Committee. It will here be desirable to state in a few words what course is pursued at the central observatory in order to test the accuracy of the tabulations.

In the first place it may be mentioned that in the case of the thermograph it does not appear probable that a large error in the reading of one or more degrees if made will pass unnoticed; for if the tabulator be reading the scale in a wrong manner, he will carry on his wrong readings until the first observation hour, when they will at once be discovered by reference to the standard. He is in such circumstances instructed to retrace his steps until he arrives at the commencement of his mistake. When the thermograph curves and tabulations arrive from any of the various outlying observatories, they are subjected to the following treatment:—

- (1.) All those cases are examined by means of a duplicate tabulating scale kept at Kew, in which the recorded thermograph temperature is half a degree or more different from the corresponding standard reading, and the cause of this difference is ascertained, and if an error has been made this error is corrected.
- (2.) All those cases are examined in which the wet bulb appears to be wrong, and should the observer have tabulated an erroneous reading this is rejected.
- (3.) All the dry bulb readings are compared with the corresponding wet, and should the latter ever appear higher than the former the case is examined.
- (4.) The maximum and minimum temperatures are examined. These denote the highest and lowest temperatures as shown by the curves for each civil day.
- (5.) Twelve re-measurements are made for each month's curves at Kew by means of the duplicate tabulating scale, and the mean difference between these and the observer's result is recorded. It is proposed that in future 48 measurements be made.
- (6.) The monthly mean difference between the simultaneous standard and thermograph readings is also recorded.

The following results have been obtained for the various observatories up to the end of June:—

	Kew.					Stonyhurst.					Glasgow.					Aberdeen.					Falmouth.					Armagh.				
	Mean difference between thermograph and standard readings.		No. of remeasurements made.	Mean difference between 1st and 2nd measurements.																										
	(1)	(2)		(4)	(5)	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
	Dry.	Wet.	(3)	Dry.	Wet.	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Jan. -			12	·06	·05	·06	·11	12	·08	·12	·14	·16																		
Feb. -	·10	·10	12	·05	·06	·11	·20	12	·08	·07	·13	·13	12	·06	·05															
March	·08	·07	12	·04	·03	·18	·35	12	·09	·30	·13	·14	12	·04	·05															
April	·08	·08	12	·04	·05	·12	·15	12	·10	·12	·12	·15	12	·09	·15	·17	·16	12	·15	·15										
May -	·07	·08	12	·04	·07	·10	·16	12	·10	·05	·11	·11	12	·08	·12	·18	·18	12	·16	·12	·13	·12	12	·10	·12	·10	·12	12	·12	·10
June -	·06	·07	12	·06	·08	·10	·15	18	·09	·08	·15	·12	12	·05	·10	·18	·17	12	·11	·12	·13	·09	12	·13	·07	·13	·13	12	·09	·14

This table would appear to indicate that when the curves of the various thermographs are treated after the method now described a very great amount of accuracy is obtained, while it may perhaps be inferred that the amount of local peculiarity is small in the case of these instruments.

ANEMOGRAPH.

The accuracy of the anemograph is like that of the thermograph, liable to be deranged by three causes.

- (1.) By a cause depending on the situation and exposure of the instrument.
- (2.) By instrumental deficiencies, such as friction.
- (3.) By a deficient system of tabulation.

Situation of Instruments.—These instruments are placed on the highest points of the various observatories, and as far as possible out of the reach of local influences.

No experiment has yet been made with the view of testing the influence of situation. It is proposed that the spare anemograph which has been made by R. Munro for the Meteorological Committee be erected in the grounds of Kew observatory with this object; the expense attending such an experiment would not be great.

Instrumental Deficiencies.—Friction is the most important of these, and must to some extent affect both the records of direction and velocity.

The axle of the direction vane moves in a wooden bearing, which is saturated with oil. In the spare instrument which has been made for the Meteorological Committee the fans are made somewhat larger, and the axle moves in a metallic bearing, which has an arrangement by which it is kept well supplied with oil. If this instrument be erected in the Kew observatory grounds, we may be able to determine if these changes are improvements, at the same time that light is thrown upon the problem of situation.

As regards the influence of friction upon the velocity records of these anemographs, this has probably been determined in the case of the Kew instrument, and also in the case of the spare anemograph recently constructed. It is proposed that a mean friction coefficient be determined from all instruments constructed after this method when they are first made, and before they are erected, and that this mean coefficient be applied to the results observed from the anemographs of the Meteorological Committee, as it is not possible to ascertain the friction correction of an instrument when once mounted without much trouble and expense.

From an inspection made by me of the anemographs at Stonyhurst, Glasgow, and Aberdeen, I do not think that any other instrumental error need be regarded.

System of Tabulation.—When the anemographs are received at Kew from the various outlying observatories they are subjected to the following tests:—

- (1.) The curves are examined in order to ascertain if there be any instrumental defect.
- (2.) The recorded directions are glanced over and mentally compared with the tracing; any important error is thus likely to be discovered.
- (3.) The velocities are gone over in the same manner.
- (4.) All peculiar cases of sudden change of direction are examined.
- (5.) Twelve re-measurements of velocity are made for each month (48 will be made in future) selecting some of those hours when the sheet is changed and some of those for which the trace is in two different columns, in order to see if the observer is acquainted with the proper method of measuring them.
- (6.) Twelve re-measurements of oscillation are also made, and it is seen that for each of these the direction is properly recorded (48 will be made in future).

The following results have been obtained from the various observatories up to the end of June:—

	Kew.			Stonyhurst.			Glasgow.			Aberdeen.			Falmouth.			Armagh.			Valencia.		
	No. of measurements made.	Mean difference.		—			—			—			—			—			—		
		Direction.	Velocity.																		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)						
Jany.	12	0.2	0.7	12	0.4	1.0	12	0.8	0.5	—	—	—	—	—	—						
Feb.	12	0.0	1.0	12	0.0	0.7	12	1.0	0.4	—	—	—	12	0.5	0.5						
March	12	0.3	0.8	12	0.1	0.6	12	0.2	1.0	10	0.5	1.0	12	0.2	0.9						
April	12	0.1	1.0	12	0.1	0.5	12	0.2	0.7	12	0.4	0.8	10	0.3	1.1						
May	12	0.5	0.9	10	0.5	0.3	12	0.7	0.3	12	0.5	0.9	12	0.2	1.1						
June																					

* The anemograph of Dr. Robinson is somewhat different from the others. Arrangements could not therefore be well made for checking his results at Kew, and as these results are obtained under Dr. Robinson's personal superintendence they may be regarded as correct.

† Not in operation until July.

Resolved—That copies of this report be distributed to the various members of the Kew Committee.

At the request of the Rev. Dr. Robinson, of Armagh, the sum of 10*l*. was voted to him, in order to defray the extra expense which his assistant Mr. Call incurred while receiving instruction at the Kew Observatory.

The following cheques were drawn :—

For salaries for October.

	£	s.	d.
R. H. Scott - - - - -	66	13	4
H. Toynbee - - - - -	33	6	8
B. Stewart - - - - -	33	6	8
W. Salmon - - - - -	17	10	0
J. S. Harding, jun. - - - - -	13	6	8
*R. Strachan - - - - -	15	16	8
F. Gaster - - - - -	9	3	4
C. Harding - - - - -	8	6	8
R. H. Curtis - - - - -	6	19	2
†J. S. Harding, sen. - - - - -	6	0	0
‡F. Steventon - - - - -	3	6	8
T. Kerr (Valencia) - - - - -	20	16	8

Accounts.

Magnetic Telegraph Co., September	-	56	10	7
Submarine „ „	-	32	1	1
R. Grant, outfit at Glasgow	-	24	13	5
T. R. Robinson, outfit and expenses at Armagh	33	2	11	
B. Stewart, travelling - - -	-	27	19	9
Kew Committee, expenses of observatories	-	5	17	6
Thos. Tiller, packing cases, &c.	-	4	4	6
P. Adie, instruments for observatories	-	42	0	0
T. R. Robinson, assistant's expenses	-	10	0	0

£471 2 3

* With extra allowance for care of instruments.

† Four weeks.

‡ From 15th October.

The Committee then adjourned until Monday, November 2, at 3 p.m.

METEOROLOGICAL COMMITTEE.

2, Parliament Street, Monday, November 2, 1868.

PRESENT :

General Sabine in the Chair.

Mr. Galton.

Dr. W. A. Miller.

Mr. Spottiswoode.

Mr. Gassiot.

The Director and the Secretary of the Committee were in attendance.

The minutes of the last meeting were read and confirmed.

Mr. Scott reported that the letters which he had been instructed at the last meeting to send to Dr. Keith Johnston and to Admiral Manners had been forwarded on 27th inst.

Mr. Scott submitted the following draft of a letter which he proposed sending to the Scottish Meteorological Society regarding outstanding instruments.—Approved.

DEAR SIR,

I AM instructed by the Committee to inform you that this office is engaged in tracing the present disposal of the large number of instruments now outstanding on its books.

It appears that instruments to the total value of 100*l.* have been at various times issued to the Scottish Meteorological Society for use at its various stations, both home and foreign, in addition to the 12 sets originally presented to the society.

I enclose a list of these, and am further instructed to request that you will have the goodness to say whether all of these instruments are required by your society or not, as in the latter case this office would be very glad to have them restored, for use at sea. If, however, your Council wish to retain a part, or even the whole of them, I am to inform you that this Committee would be prepared to present such of them as you may require to the society, so that they can be removed from our books.

There are a series of observations from Janina in this office, which perhaps you might wish to have in order to complete your records from that station.

ROBERT H. SCOTT.

A. Keith Johnston, Esq., LL.D.,
Hon. Sec., Scottish Meteorological Society.

Mr. Scott submitted a letter from Capt. Veron (of the French Ministry of Marine) requesting certain meteorological information from the North Atlantic Ocean for December 1867.

Resolved—That Mr. Scott prepare a draft reply to be laid before the Committee at their next meeting.

Mr. Scott submitted a letter from Herr von Freeden, Director of the Hamburg Meteorological Office, stating that there was a reasonable prospect of his being able to send from the 1st January next daily telegraphic weather reports from Hamburg to London; and that in consequence of his having received on Friday, October 23rd, intelligence from this office of a very severe gale which did not reach Hamburg till the ensuing Sunday, the harbour authorities at Hamburg have resolved to hoist the drum signal there and at Cuxhaven whenever information of meteorological disturbance is received from this office.

Resolved—That Mr. Scott be requested to append notice of this fact to one of his daily weather reports sent to the newspapers.

Resolved—That Mr. Stewart be directed to call the attention of the directors of the outlying observatories to the great importance of having no failure in the traces of the self-recording instruments, whether owing to want of gas or any other cause.

E e +

Read the following letter from Professor D. Thomson, of Aberdeen, to the Secretary :—

(Copy.)

25th October 1868.

MY DEAR SIR,

I HAVE had recently another communication from the Army and Medical Department, asking for the decision of the Meteorological Committee as to their former application. Would you be so good either to furnish me with a formal deliverance, or (which appears to me more simple) communicate directly yourself with the Board?

I regret to have to inform you that I have been ordered by my medical adviser to abstain from work for some months, and to winter in a milder climate. I am at present engaged in making arrangements for devolving my duties here on a competent substitute. When I shall see my way more clearly, I will submit to you some proposal for carrying on the meteorological observations here, which I hope will meet with the approval of your Committee. I cannot express my deep regret that my health should have so unexpectedly broken down within the first year of our operations, but I am given to understand that I may look to complete recovery before next summer.

Believe me very truly yours,
(Signed) DAVID THOMSON.

B. Stewart, Esq., LL.D.

Mr. Stewart stated that he had since been informed by Professor Thomson that he had made arrangements with Professor Fuller to be his substitute during his absence on the continent; which arrangement was approved by the Committee.

Resolved—That Mr. Stewart be requested to reply to Professor Thomson that as long as the Aberdeen Observatory is maintained as at present, the Committee would not object to its director giving to the Army Medical Department the information which they desire, provided this be done without expense or detriment to the Committee, and it be stated that the information is given with their permission.

Mr. Scott submitted certain returns from foreign land stations which had been received at the office, and had been registered, although the information contained in them was of very little value.—Permission granted to have them removed from the register of the office.

The Committee then adjourned until Monday, 9th inst., at 3 p.m.

METEOROLOGICAL COMMITTEE.

2, Parliament Street, Monday, November 9, 1868.

PRESENT :

General Sabine in the Chair.

Col. Smythe.

|

Mr. Spottiswoode.

The Director and the Secretary to the Committee were in attendance.

The minutes of the last meeting were read and confirmed.

In consequence of it being Lord Mayor's Day, the meeting was adjourned until Monday, 16th inst., at 3 p.m.

METEOROLOGICAL COMMITTEE.

2, Parliament Street, Monday, November 16, 1868.

PRESENT :

General Sabine in the Chair.	
Mr. Galton.	Mr. De La Rue.
Mr. Spottiswoode.	Dr. W. A. Miller.
Mr. Gassiot.	

The Director and the Secretary to the Committee were in attendance.

The minutes of the last meeting were read and confirmed.

Mr. Scott reported that the letter which he had been instructed to send to Dr. Keith Johnston had been sent on 3rd inst.

The following draft of a letter to Capt. Véron, ordered on the 2nd ult. to be prepared, was read and approved:—

SIR,

I HAVE the honour to inform you that I have received permission from the Committee to furnish you with copies of all the observations which have hitherto been received at this Office, relating to the Atlantic Ocean during the month of December 1867. The number of registers received is not large, inasmuch as the Office had not then commenced the re-issue of instruments to captains on an extended scale, but for any month in 1868 the information would be much fuller.

I am to state that in addition to these extracts the Office could furnish you with records of a self-registering anemometer from a station in the Orkney Islands if you should wish for them. The Committee are very glad to be able on the present occasion to furnish this information to you, as a slight acknowledgment of the assistance so liberally afforded to them by the Ministry of Marine.

The copies will be sent as soon as they are ready.

M. V. Véron,
Capitaine de Frégate,
Ministère de la Marine, Paris.

I am, &c.,
(Signed) ROBERT H. SCOTT.

Mr. Galton presented the following report regarding the coastguard returns of storms made to this Office:—

The coastguard stations, from which six hourly reports are received on the occasion of each storm, are about 180 in number. One clerk of the Meteorological Office is fully occupied in discussing these returns, but they accumulate at about double the pace at which he can deal with them.

The result of all this labour is untrustworthy; for the observations themselves are bad, as is abundantly shown by their frequent disagreement among themselves. The conditions under which they are made are such as to render it unlikely that much care should be commonly taken about them. It is probable also that the position of the stations is often disadvantageous, especially when they are built in coves sheltered from the winds upon which the observers have to report.

Under these circumstances, and considering that we have already an excellent check on the weather returns from the telegraph stations in the curves furnished by the seven observatories, I fully concur with Mr. Scott, that the Meteorological Office should cease to occupy itself with the coast-guard returns, and that the clerk's time hitherto devoted to their discussion should for the future be bestowed on some more important work connected with the investigation of storms.

November 6, 1868.

FRANCIS GALTON.

Resolved—That Mr. Scott be requested to communicate the substance of this report to Mr. Farrer, and bring the matter before the Committee at another meeting.

Mr. Scott presented the following report regarding the curves of the self-recording instruments:

REPORT.

GENTLEMEN,

I HAVE undertaken the investigation of the results furnished by the curves of the self-recording instruments for the latter part of September—from the 19th to the 30th.

I have found a number of cases in which the curves are defective, and also a number of cases in which the differences between the reduced corrected readings do not appear to agree with the course of the curves.

The only curves examined have been the barograms and anemograms from Kew, Stonyhurst, Falmouth, Glasgow, and Aberdeen.

I beg to submit a list of these, and to request instructions for dealing with such matters in future.

ROBERT H. SCOTT.

ERRORS in BAROGRAPH TABULATIONS, &c., from Five Self-registering Observatories, during the Week
19th September to 25th September 1868.

Observatory.	Date.		Reading affected.	? Amount of Error.	Remarks.
	Day, &c.	Hour.			
	1868.				
Stonyhurst -	Sept. 19th	8 a.m. -	Corrected pressure	·040	Arithmetical error.
Do. -	" 20th	5 p.m. -	Do. -	·040	Do.
Do. -	" 22d	11 a.m. -	Do. -	·040	Do.
Glasgow -	" 23d	9 p.m. -	Do. -	·001	Do.
Falmouth -	" 23d	5 p.m. to midnight.	All tabulated	?·050	A sudden decrease of more than ·050 in. in pressure between midnight of 23d and 1 a.m. of 24th, which is not shown in the curve; and the small <i>apparent</i> correction on this day compared with other days makes it probable that all <i>these</i> readings are erroneous. But, assuming the values given to be <i>right</i> , the necessary "correction to H" should be +·003, not —·006 as applied.
Stonyhurst -	" 24th	5 p.m. -	All tabulated (at 5 p.m.)	?·040	Measurement wrong; the oscillation not shown in the curve.
Kew -	" 25th	10 a.m. -	All tabulated	?	Either the 9 a.m. or 10 a.m. reading seems wrong, as the change in rate of falling between 9 and 10 a.m. is not shown on the curve; but there is a fault in the curve at about 10 a.m.
Do. -	" 25th	7 p.m. -	Corrected pressure	·100	Arithmetical error.
Falmouth -	" 25th	10 a.m. to noon.	All tabulated at 11 a.m.	?	An oscillation is tabulated which <i>seems</i> greater than the curve shows; but the <i>curve</i> at <i>noon</i> is defective.

NOTE.—The application of a fresh "correction to H" for each day sometimes gives the appearance of an oscillation where none really exists. Thus, in Stonyhurst Records, from 10 p.m. Sept. 24th to 2 a.m. 25th, the curve, measurements, and *uncorrected* readings all show a continuous decrease, whilst in the "corrected pressure" an *increase* appears from midnight to 1 a.m., after which the *decrease* is continued.

During the week from Sept. 19th to 25th, 1868, the following faults—sufficient to interfere with the correct measurement of the curves—are found:—

Aberdeen.—Sept. 20th, at about 4.20 a.m., the trace fails for about 15 minutes: cause not known.

Glasgow.—Sept. 23d, noon. Lower part of curve blurred and indistinct.

Stonyhurst.—Sept. 19th, 10 a.m., to 21st, 10 a.m. Upper part of the curve not visible.

Sept. 21st, noon. Upper part of the curve not visible.

Kew.—Sept. 19th, 8 to 10.30 a.m. Curve blurred, mostly at the upper part.

Sept. 19th, noon. The mark for noon out of place, but measurements correctly made. Trace then fails for about half an hour, and is indistinct throughout the greater part of the sheet; edge inked in.

Sept. 21st to 23rd. The curve badly defined in several places; the edge inked in.

Sept. 25th, 9.20 a.m. No curve for half an hour. A similar defect for nearly an hour just before noon, and the curves for this sheet very faint at times; the edge inked in.

Falmouth.—Sept. 20th, 8 a.m. to noon. Some singular defects in the curve, apparently by shifting the paper?

Sept. 19th, 1 p.m. Curve blurred at top: edge inked in.

Sept. 22d, 2 a.m., to 23rd, 10.8 a.m. Top of curve defective; cannot be measured; and from 10.8 a.m. to 4.17 p.m., clock stopped; no trace.

Sept. 25th, noon. Bottom of curve defective.

Dr. Miller submitted the following proposal regarding the best means of checking the residual barometrical correction:—

The curves from each instrument to be tabulated in each observatory, and checked by the subsidiary instrument (ivory scale) at each observatory.

The residual correction then to be applied at each observatory, and tabulated.

The tables of this residual correction to be recalculated in each case at Kew, and compared with the table sent up by each observatory.

Might not the residual correction be made from curve to curve instead of from day to day?

Mr. Scott stated that in the course of inquiries into the present disposal of the instruments now outstanding on the books of the Office, he had received the following replies, with reference to which he requested instructions :—

Professor C. Piazzì Smyth stated that the instruments issued to him for the purposes of his expedition to Teneriffe in 1856, had been left by him in charge of Herr Kreitz, of Puerta Orotava, in that island.

Resolved—That the instruments be written off.

W. W. Rundell, Esq., of Liverpool, stated that an azimuth compass originally lent to him for investigations connected with the proceedings of the Liverpool Compass Committee was still in his possession and occasionally employed by him.

Resolved—That Mr. Rundell be allowed to retain this instrument on loan.

Mr. W. Vickers, of Lancaster, stated that a barometer originally lent to him was used for the purpose of correcting the barometers of ships coming into Morecambe, &c.

Resolved—That Mr. Vickers be allowed to retain this instrument on loan.

Mr. Merrifield, of the Navigation School, Plymouth, stated that the instruments in his charge were used for the purposes of instruction of the pupils at the school.

Resolved—That the Plymouth Navigation School be allowed to retain a set of instruments on loan.

At Mr. Galton's suggestion Mr. Scott was requested to prepare a report on the subject of lithographing the curves of the self-recording instruments.

Mr. Scott presented an application from the authorities at Banff, requesting to have a copy of the weather report sent daily for the next six months.

Resolved—That this request be granted.

Read—The following letter from the observer at Heart's Content :—

Anglo-American Telegraph Company, Hearts Content Station,
Newfoundland, 12th October 1868.

DEAR SIR,

BEFORE the winter sets in will you please change the time of despatching our weather report—6 a.m. on a winter's morning, with thermometer at zero, is no joke, especially when time is occupied searching for the rain gauge.

If Report is sent at 9 a.m. (or even at 8 a.m.), but former preferred, it will be far better for us, and you will have the advantage of greater accuracy in reading, inasmuch as if report be sent at 9 a.m. it will be made up always by the same individual, while at present it depends on no less than six people.

Please consider this matter, and let me know as early as convenient.

Yours very truly,

R. H. Scott, Esq.

E. WEEDON, Superintendent.

Resolved—That Mr. Scott be instructed to make arrangements with the Anglo-American Company with reference to adopting the hours of observation most suitable to the convenience of the company's officers, and that he notify this fact of the change of hour to the Observatoire Impériale at Paris, when the arrangements are concluded.

Mr. Scott stated that the Department of Agriculture of the United States had sent the Office some of its publications through the Smithsonian Institution, and had applied for the publications of this Office in exchange.—Granted.

Resolved—That barograph tabulating instruments (costing 10*l.* 12*s.* each) be procured for the observatories of Aberdeen, Falmouth, Armagh, and Valencia.

The Committee then adjourned until Monday, 23rd instant, at 3 p.m.

METEOROLOGICAL COMMITTEE.

2, Parliament Street, Monday, November 23, 1868.

PRESENT :

General Sabine in the Chair.

Mr. Galton.

Mr. Spottiswoode.

Mr. De La Rue.

Capt. Richards.

Mr. Gassiot.

The Director was in attendance.

The minutes of the last meeting were read and confirmed.

Mr. Scott reported that he had sent to Capt. Véron the letter adopted at last meeting, and had received a reply from him acknowledging the kindness of the Committee, and requesting that the anemometrical returns from Orkney might be sent also.

Resolved—That Mr. Scott be permitted to have these returns reduced and forwarded as requested by Capt. Véron.

Read—The following report, ordered at last meeting to be prepared.

I submit herewith a set of curves which are a modification of those lithographed in August last.

The space allowed for each observatory has been increased, as that originally proposed was found to be insufficient.

The expense of lithography of these curves, as furnished to me by Day and Son, would be:—

						Daily.		Annual.		
						s.	d.	£	s.	d.
For 100 copies	-	-	-	-	-	14	9	268	14	0
150 „	-	-	-	-	-	19	0	346	7	6
200 „	-	-	-	-	-	23	2	422	8	0
250 „	-	-	-	-	-	27	0	492	7	6

Including the expense of 2s. per sheet for the transfer paper bearing the form.

In addition, there is the annual cost of 4l. 10s. for drawing the form on the stone. The time taken in tracing eight sets of these curves for one day, from the original photographs, is about five hours. Accordingly, a clerk's entire time (value at least 100l. a year) would be required for the office work of such a publication. I may add that the transfer paper with the form must be furnished weekly to the office, as it will not keep for a long period without danger of failure of the process.

ROBERT H. SCOTT.

Resolved—That as soon as a complete series of curves for one fortnight, exhibiting some marked disturbances of weather, shall have been received from the seven observatories, the same be lithographed as a specimen (100 copies) and distributed privately to meteorologists, with the view of eliciting their opinion as to the proposed method of publication.

Mr. Scott reported that the meteorological documents received from the under-mentioned land stations have been removed from the office registers, as directed by minute of the 2nd instant:—

Bremen	-	-	Daily wind and weather reports.		
Hamburg	-	-	Do.	do.	
Colombo	-	-	Do.	do.	
Point de Galle	-	-	Do.	do.	
Messina	-	-	Daily barometrical readings, with wind and weather reports.		
Carthage	-	-	Monthly abstracts, showing average temperature and prevailing winds.		
Tralee	-	-	Monthly abstracts, showing mean pressure and temperature, and prevailing winds.		
Corfu	-	-	Do.	do.	do.
Mobile	-	-	Account of damage caused by hurricane of 15th September 1860.		
Elsinore	-	-	Daily meteorological observations. Nothing known respecting instruments. Foreign scales used.		
Gothenburg	-	-	Do.	do.	do.
Rostock	-	-	Do.	do.	do.

The following are the official numbers under which the documents in questions were registered:—22, 23, 30, 31, 103, 104, 233, 234, 345, 346, 387, 388, 483, 483*a*, 565, 566, 667, 675, 676, 759, 769, 771, 778, 779, 780, 781, 782, 783, 784, 786, 787, 788, 789, 790, 793, 794, 795, 796, 797, 826, 827, 920, 921, 922, 923, 958, 959, 1,069, 1,071, 1,085, 1,089, 1,122, 1,182, 1,202, 1,203, 1,223, 1,223*a*, 1,224, 1,230, 1,231, 1,243, 1,244, 1,258, 1,281, 1,282, 1,299, 1,313, 1,314, 1,315, 1,316, 1,379, 1,380, 1,419, 1,420, 1,421, 1,422, 1,443, 1,443*a*, 1,513, 1,514, 1,519, 1,521, 1,535, 1,535*a*, 1,608, 1,609, 1,628, 1,628*a*, 1,682, 1,683, 1,722, 1,722*a*, 1,736, 1,765, 1,777, 1,805, 1,805*a*, 1,841, 1,852, 1,853, 1,874, 1,874*a*, 1,912, 1,915, 1,925, 1,925*a*, 1,962, 1,973, 1,978, 1,985, 1,985*a*, 2,012, 2,013, 2,033, 2,049, 2,054, 2,054*a*, 2,097, 2,098, 2,099, 2,135, 2,172, 2,173, 2,210, 2,211, 2,216, 2,260, 2,261, 2,281, 2,313, 2,332, 2,363, 2,364, 2,390, and 2,391.

He also submitted a memorandum from Captain Toynbee, stating that he had found the following logs to be so incorrect as to be useless for purposes of discussion.

- Nos.
- 380. Generally bad.
 - 394. Generally defective.
 - 416. Barometer bad, only one wind daily, defective in other ways.
 - 417. Barometer, dry and damp bulb, wind force, sea temperatures, &c., bad or wanting.
 - 469. Barometer not trustworthy, winds often omitted, generally defective.
 - 475. Generally defective.
 - 480. The barometer is made to rise daily until 2 or 3 p.m., and then to fall until midnight.
 - 484. The entry of the barometer destroys confidence.
 - 486. Instruments not understood.
 - 491. Barometer range not good, wind rarely entered.
 - 492. Generally bad.
 - 493. Barometer so bad it shakes confidence.
 - 503. Barometer bad, and otherwise defective.
 - 506. Barometer so badly handled that I doubt other entries.
 - 508. Barometer and wind very defective.
 - 514. Very bare of observations, and they do not seem good.
 - 515. Entries few and very bad.
 - 516. Very neat, but barometer and wind bad.
 - 520. The entries are few and seem to be bad.
 - 534. Winds omitted, barometer bad.
 - 539. Generally bad; winds might be used.
 - 547. Barometer bad, wind often neglected.
 - 548. Barometer very bad, wind bad, &c.
 - 582. Barometer very bad, scarcely anything else.
 - 583. Barometer not understood, other entries bare and bad.
 - 587. Wind and barometer bad.
 - 589. Barometer very bad, no attached thermometer, little else.
 - 590. Barometer bad, same thermometer for air and water.
 - 592. Very bad.
 - 594. Bad.
 - 596. The barometer does not seem to have been read properly.
 - 597. Barometer not trustworthy, and bare.
 - 600. A disgraceful piece of cooking.
 - 601. Barometer very bad, winds reversed, damp bulb seems to have been in water.
 - 603. A disgraceful piece of cooking.
 - 609. Barometer not understood, generally bad.
 - 610. Ditto ditto.
 - 627. Barometer bad.
 - 636. Barometer not understood, other observations doubtful.
 - 643. Generally very bad and bare.
 - 655. Barometer only read to tenths, very bare.
 - 657. Very bare and bad.
 - 659. Barometer and wet bulb very bad, very bare.
 - 660. Barometer and winds very bad.
 - 686. Bad and bare.
 - 687. Ditto.
 - 688. Ditto.
 - 699. Barometer very bad, others doubtful.
 - 711. Barometer very bad, a manuscript form.
 - 732. Barometer the same for days together in the tropics.
 - 749. Very bare and very bad.
 - 750. Very bare, barometer not understood.
 - 809. Very bad and bare.
 - 817. Barometer seems to be a shameful piece of cooking, bare and bad.
 - 841. Barometer so badly handled I cannot trust others.

Captain Toynbee accordingly requested permission to have these logs removed from the Office Register.

Resolved—That Capt. Toynbee be permitted to remove these logs from the Register, as suggested by him.

Mr. Scott stated that he understood that the Hydrographic Department of the Admiralty was engaged in the preparation of pilot charts of the Indian Ocean, similar to those just published for the Atlantic, and he requested permission to employ the staff of the office, at extra hours, in completing the work for this region, which had been left by Admiral Fitzroy in an unfinished condition, in order that it might be embodied in the proposed publication, if found suitable for it.

Resolved—That Mr. Scott be authorized to commence this work at once, and to expend a sum not exceeding 100*l.* on it.

Mr. Scott reported, that since the meeting of the 26th October, applications for telegraphic weather intelligence have been received from Kingstown, and from the Admiralty, for Devonport and Woolwich Dockyards, and also that these stations have, since that date, been placed on the list of stations warned.

The following cheques were drawn for salaries, for November:—

	£	s.	d.
R. H. Scott - - - - -	66	13	4
H. Toynbee - - - - -	33	6	8
B. Stewart - - - - -	33	6	8
W. Salmon - - - - -	17	10	0
J. S. Harding, jun. - - - - -	13	6	8
R. Strachan - - - - -	*15	16	8
F. Gaster - - - - -	9	3	4
C. Harding - - - - -	8	6	8
R. H. Curtis - - - - -	6	19	2
J. S. Harding, sen. - - - - -	†6	0	0
F. Steventon - - - - -	6	13	4
T. Kerr (Valencia) - - - - -	20	16	8
Total - - - - -	£237	19	2

* Including extra allowance for care of instruments.

† For four weeks.

The Committee then adjourned to Monday, Dec. 7, at 3 p.m.

METEOROLOGICAL COMMITTEE.

2, Parliament Street, Monday, December 7, 1868.

PRESENT :

Dr. W. A. Miller in the Chair.

Mr. Galton. Mr. Spottiswoode. Mr. Gassiot.		Gen. Sabine. Mr. De La Rue. Capt. Richards.
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The Director and the Secretary to the Committee were in attendance.

The minutes of last meeting were read and confirmed.

Read—The following letter from the Board of Trade:—

(M. 10,918.)

SIR,

Board of Trade, December 7, 1868.

I AM directed by the Board of Trade to request that they may be informed of the sum which, in the opinion of the Meteorological Committee, will be required to defray their expenses during the year 1868-9.

R. H. Scott, Esq., Meteorological Office.

I am, &c.
(Signed) THOMAS GRAY.

Mr. Scott was instructed to inform the Board of Trade that the amount required by the Committee would be 10,000*l.*, being the same sum as was voted for the present year.

Resolved—That the following detailed estimate be printed on the minutes:—

METEOROLOGICAL OFFICE.—ESTIMATE for year 1869-70.

Estimated for 1868-69.				Proposed for 1869-70.			
	£	s.	d.		£	s.	d.
Salaries - - -	2,650	0	0	Salaries - - -	3,000	0	0
Expenses of Observatories -	2,000	0	0	Expenses of Observatories -	2,000	0	0
Instruments, Mercantile				Instruments, Mercantile			
Marine - - -	400	0	0	Marine - - -	400	0	0
Instruments, Admiralty -	500	0	0	Instruments, Admiralty -	500	0	0
Agencies at Ports - - -	100	0	0	Agencies at Ports - - -	150	0	0
Travelling - - -	350	0	0	Travelling - - -	150	0	0
Telegraphy - - -	3,000	0	0	Telegraphy - - -	3,000	0	0
Photo-lithography - - -	500	0	0	Special Printing - - -	100	0	0
Office Expenses - - -	500	0	0	Office Contingencies -	700	0	0
	£10,000	0	0		£10,000	0	0

Mr. Scott stated that pursuant to the instructions received on the 16th November, he had conferred with Mr. Farrer and Mr. Gray respecting the Coastguard Weather Reports, and he submitted the following draft of a letter on the subject, which was approved:—

SIR,

WITH reference to my letter to the Board of Trade, dated November 19th, 1867, respecting the proposed arrangements for checking the issue of telegraphic weather intelligence,—

I am instructed by the Committee to say that, as their observatories for continuous registration of meteorological information in various parts of these islands are now in operation, they scarcely deem it necessary to ask the Comptroller-General of Coastguard to continue to furnish them with weather reports (Form Wr. 37) from *all* his stations, as he kindly consented to do in answer to the request of the Board of Trade.

Accordingly the Committee would venture to suggest that the reports in question might be from henceforward discontinued from almost all of the stations, with the exception of a selected number lying on the west coasts of Ireland and Scotland, from which this office receives no information whatever.

I am instructed by the Committee to express to you, and to the Comptroller-General of Coast-guard, their sincere thanks for the co-operation so readily afforded, and their hope that it may be possible for the Coastguard to continue to furnish similar returns from certain stations (say ten or twelve) situated on the coasts which I have indicated.

Thomas Gray, Esq.,
Assistant Secretary, Board of Trade.

I have, &c.
(Signed) ROBERT H. SCOTT,
Director.

Mr. Scott reported that he had sent to Capt. Véron extracts from 13 logs, and also the returns from the anemometer at Sandwick Manse, Orkney.

Read—A letter from the Magnetic Telegraph Company, asking for an increase of salary to E. O'Sullivan, telegraph clerk at Valencia, on account of Sunday duties.

Resolved—That the allowance be increased to 5s. per week.

Read—The following letter to Mr. Gassiot :—

MY DEAR SIR,

Bank of England, Nov. 24, 1868.

I HAVE been at Whitby during the last equinox, and took great interest in the storm signals on that dangerous coast, and I write the general result for you to lay before the Committee for their information.

1. The barometer was of the highest importance to the fishermen. Every morning they walked up the pier to examine it, and their decision was most materially guided by its rising and falling.

2. The storm signal seemed to be of secondary importance to the indication of the barometer, though of great use taken in conjunction with it and the reason for its being hoisted. Upon this matter I have a suggestion to make. I found that whenever the drum was hoisted every sailor knew the reason of its being hoisted from the Preventive Service men, and they would tell me that there was a great storm raging in the Channel, a high wind on the coast of Scotland, and one day that there was a storm so near as Yarmouth.

Now I recommend that the reasons for the hoisting of the drum be always posted up in writing, as I am quite confident that these men are thinking of the bearing of the question all day long, and gradually they will use the drum in conjunction with the barometer, and obtain for each place much closer results than can be obtained by any other method.

Practically my recommendation is to give the fishermen facts for them to apply. I think then great results will ensue, and they will be able to bring the foretelling of the weather for a few hours to as near a certainty as possible.

J. P. Gassiot, Esq., &c., &c.

I remain, &c.
(Signed) A. SMEE.

Resolved—That Mr. Scott be instructed to take steps to promote the posting up of the weather telegrams at Whitby.

Read—A letter from Mr. Blanford, Secretary to the Meteorological Committee of Calcutta, giving information as to their intended operations, and requesting a supply of the various forms and books used in the office for the work of ocean meteorology.

Also, a letter from Commodore Jenkins, Chief of the Bureau of Navigation, Washington, to a similar effect.

Resolved—That a complete set of the forms, &c., requested be supplied to both offices.

Read—A letter from the Director of the Naval Observatory, Washington, acknowledging with thanks the receipt of the Report of the Committee, and stating that the Observatory would be very happy to carry on a regular exchange of publications with this office.

Read—A letter from Capt. F. W. Thomas, R.N., stating that he no longer required the instruments lent to him by Admiral Fitzroy, and asking for instructions regarding them.

Mr. Scott was instructed to request Capt. Thomas to return them, and at the same time to assure him of the pleasure it has afforded the Committee to hear that these instruments have been of service to Capt. Thomas in his investigations into the climate and the sea surface temperature on the coast of Scotland.

Read—A letter from Rev. C. Clouston respecting the instruments lent to him for observations at Sandwick Manse.

Mr. Scott reported, with reference to this subject, that by the discussion of the anemometrical returns for December 1867, which have been sent to Capt. Véron, it had appeared that the anemometer was in need of thorough repair.

Resolved—That Mr. Clouston be permitted to retain a set of instruments, and that at the first convenient opportunity the anemometer be replaced by a new one.

Mr. Scott requested permission to make arrangements for substituting Pembroke as a telegraphic reporting station instead of Weymouth.—Granted.

Resolved—That Mr. Stewart be authorized to expend a sum not exceeding 15*l.* in procuring subsidiary tabulating instruments for the thermographs of the various observatories.

The following cheques were drawn :—

		£	s.	d.	£	s.	d.
Electric Telegraph Company, Special Charges, August	-	16	6	3			
Do.	Do. September	16	16	11			
Do.	Message account, Do.	63	6	4			
Do.	Do. October	68	13	11			
					165	3	5
Magnetic Telegraph Company, October	-	-	-	-	61	4	0
Submarine Telegraph Company, Do.	-	-	-	-	34	0	7
T. Kerr (Valencia), for Watch	-	-	-	-	10	0	0
J. S. Harding, jun., Office Expenses	-	-	-	-	15	0	0
					£285	8	0

Mr. Scott reported that the following amounts, included in the cheques drawn the 26th October, had since been refunded :—

	£	s.	d.
By Mr. Adie, on account of a thermometer omitted in supplying instruments to Glasgow Observatory	-	-	-
	0	7	6
By Mr. Stewart, on account of half a ream of blotting paper supplied to Valencia Observatory	-	-	-
	0	17	6

The Committee then adjourned until Monday, Dec. 14, at 3 p.m.

METEOROLOGICAL COMMITTEE.

2, Parliament Street, Monday, December 14, 1868.

PRESENT :

General Sabine in the Chair.

Dr. W. A. Miller.
Mr. Gassiot.

Mr. Spottiswoode.
Mr. Galton.

The Director and the Secretary to the Committee were in attendance.

The minutes of the last meeting were read and confirmed.

Mr. Scott reported that he had forwarded to the Board of Trade the letter respecting Coastguard returns, of which the draft was approved on the 7th inst.

Also that the Coastguard officer at Whitby had signified his readiness to have the telegrams of weather posted up when received.

Read—An application from the Secretary to the Navigation School at Leith for permission to retain a set of instruments on loan for instruction of the pupils.—Granted.

Read—An application from the Secretary to the Training School, Edinburgh, with a request similar to the foregoing.

Mr. Scott was instructed to refer this question to the Board of Trade for their opinion.

Mr. Scott was instructed to write to Dr. Robinson informing him that, as the Committee were at present preparing instructions for the guidance of the meteorological observers at their new stations, they would be glad to learn how soon there was a probability of the Manual of Anemometry being ready for publication.

The Chairman of the Kew Committee presented a report from that body on the best means of ensuring accuracy in the numerical values obtained from the records of the self-recording meteorological instruments.

Resolved—That Mr. Scott be requested to give his opinion thereon, and that Mr. Stewart send copies to the Directors of the observatories of the Meteorological Committee, with the view of eliciting their opinion before the report is finally adopted.

The Chairman of the Kew Committee also stated, that with regard to instrumental verifications, it was the opinion of that body that the following might in future be the limits of error allowed in the construction of barometers, thermometers, and hydrometers by the Meteorological Office.

Marine Barometers of the pattern adopted by the Meteorological Office.—Reject all for which the index-error at the ordinary pressure is greater than 0.015 inch, or the capacity error greater than 0.004 inch, or for which the mercury does not fall from $1\frac{1}{2}$ inches to $\frac{1}{2}$ inch above the present pressure in a time between 3 and 6 minutes. These conditions regarding falling of the mercury are practically equivalent to those laid down in the first number of the Meteorological Papers issued by the Board of Trade (page 82), and also in Maury's Sailing Directions (page 374, edition 1858). But for *barometers professing to be standards*, reject all for which at the ordinary pressure the index-error is greater than 0.010 inch.

Thermometers (graduated on the stem) of the pattern adopted by the Meteorological Office.—Reject all for which the largest error at any point is greater than 0.3° Fahr., or for which any space of 10° Fahr. is more than 0.3° Fahr. wrong.

Hydrometers of the pattern adopted by the Meteorological Office.—Reject all in which the largest error at any point is greater than one division, or in which any space of ten divisions is more than six-tenths of a division wrong (each division indicating 1 part in 1,000 of the whole specific gravity).

The Chairman of the Kew Committee also stated that it had been resolved by the Kew Committee that from the beginning of 1869 the following scale of charges should be adopted for the verification of meteorological instruments at the Kew Observatory:—

Barometers, including index and capacity correction	-	-	10s. each.
Do. index correction and verification of inch scale	-	-	5s. „
Thermometers, ordinary	-	-	1s. „
Do. boiling point	-	-	2s. 6d. „
Hydrometers	-	-	1s. „

Resolved—That the recommendations of the Kew Committee regarding verifications be adopted.

The Committee then adjourned until Monday, 21st inst., at 3 p.m.

METEOROLOGICAL COMMITTEE.

2, Parliament Street, Monday, December 21 1868

PRESENT :

Dr. W. A. Miller in the Chair.

Mr. Galton.

Mr. Gassiot.

The Director and the Secretary to the Committee were in attendance.

The minutes of the last meeting were read and confirmed.

Mr. Scott submitted the following report respecting the agencies at the outports for the supply of instruments to merchant ships :

GENTLEMEN,

INASMUCH as the agencies at the various outports, with the exception of that at Liverpool, have been almost inactive for the last five years, I have thought it advisable to consult with Captain Toynbee as to the reorganization of the system, and I submit the following proposals, which have been agreed on by Captain Toynbee and myself for your approval.

The outstanding instruments at all the agencies, except that at Liverpool, to be recalled.

The appointment of all agents, except Mr. Smart at Liverpool, to be cancelled.

In the case of any future issue to ships, the fee to be 1*l.* 5*s.* for *issue*, and 1*l.* 5*s.* for *recovery* of instruments and registers, instead of the present fee of 2*l.* 10*s.* for *issue only*.

The result of the present system has been, that instruments were issued without sufficient inquiry into the capability of the recipients, insomuch that 48 per cent. of the registers received are unfit for use, owing to their inaccuracy.

Accordingly it might be considered advisable that an additional fee of 1*l.* should be granted to the agent who has issued the instruments, if the register be found deserving of the mark "excellent" at the termination of the voyage.

The appointments of all future agents to be on the above conditions, as also the continuance of Mr. Smart in his position at Liverpool.

ROBERT H. SCOTT.

Mr. Scott submitted a correspondence with the Rev. C. H. Griffith, Strathfieldsaye, respecting the supply of a copy of the Daily Weather Report and of Telegraphic Weather Intelligence to him. He stated that he had informed Mr. Griffith that the telegrams could be sent if paid for by the recipient; as to the Weather Report, the annual charge originally fixed by the Board of Trade for a daily manuscript copy was 10*l.*, and he had proposed to Mr. Griffith to pay 5*l.* for a lithographed copy, the cost to include expense of postage. This offer had been declined, and he therefore requested instructions on the subject.

Resolved—That Mr. Scott be instructed to communicate with the Board of Trade, and, if their sanction be obtained, to offer the reports for 2*l.* 10*s.* annually.

Mr. Scott submitted the following letter from Captain Toynbee :—

Meteorological Office, 2, Parliament Street, London, S.W.
December 17th, 1868.

SIR,

THE custom of this office has been to reject decimals in the extraction of thermometrical observations, and also to omit the application of all instrumental errors in the case of thermometers when they do not amount to 0·6 of a degree.

The method makes it quite possible that there shall be a constant error of a degree between the readings of dry and damp bulbs; this seems to be too much.

I would suggest that when the dry and damp bulbs are entered to decimals of a degree, the decimals should be copied into the data books; also, that when the combined errors of the dry and damp bulbs amount to a quantity sufficient to make an important error in the calculation of the dew point and humidity, the errors ought to be applied.

I shall be glad to know from the Committee what amount of error they consider to be worthy of consideration.

With the three sets of dry and damp bulbs which I read daily, I find that a combined error of 0·3 of a degree in one pair is sufficiently great to be generally appreciable in the differences between dry and damp bulbs.

Yours, &c.

R. H. Scott, Esq.

20708.

HENRY TOYNEBEE.

Resolved—That Captain Toynbee's suggestion be adopted, and the corrections applied to thermometrical observations in future.

Read—Letter from Rev. C. Clouston, respecting the repairs to the Orkney anemometer (see p. 94).

Mr. Scott was instructed to make arrangements for renewing the instrument with as little delay as is practicable.

Mr. Scott stated that he had arrived at the conclusion that it would increase the efficiency of the Office if a division of the work into two branches, viz., a sea and a land branch, were effected; the latter to be entrusted with the weather reports, as well as the discussion of the curves furnished by the self-recording observatories. He proposed to hand over the preparation of the weather reports to Mr. Gaster.

Approved.—Details to be arranged by Mr. Scott.

Resolved—That, in consideration of the special services rendered by Mr. Gaster, a gratuity of 10*l.* be presented to him, and that his salary, at the termination of the present financial year, be raised to 130*l.*, and be increased 10*l.* per annum until the maximum 160*l.* be reached, contingent upon the continuance of the Committee.

The Secretary brought before the Committee the details of a correspondence between the observer at the Falmouth Observatory and himself, relative to an accident that had happened to the Falmouth anemograph on 7th inst.

Resolved—That the Secretary be instructed to write to the Royal Polytechnic Institution of Falmouth, recalling to them the terms of the agreement between them and this Committee, in virtue of which the instruments were to be kept in continuous operation, and expressing the opinion of this Committee that, in the case of the above stoppage of the anemograph, the accident was not repaired with sufficient promptitude.

Mr. Scott suggested several alterations in the Report of the Kew Committee on the best means of ensuring accuracy in the numerical values obtained from the readings of the self-recording meteorological instruments (see Minutes, page 97), which were adopted, and the Report was ordered to be printed as follows:

REPORT from the Kew Committee on the best Means of ensuring Accuracy in the Numerical Values obtained from the Records of the self-recording Meteorological Instruments.

IT is not proposed in this report to discuss the principles of construction of the various self-recording instruments, nor the photographic method employed in those instruments which use photography, but rather looking on these points as either settled or in progress of settlement, to investigate how the results afforded by such instruments can most advantageously be made use of to ascertain the truth.

Having thus defined the basis of these remarks, we may group under three divisions the various errors with which the traces derived from these instruments are liable to be affected.

- (A.) Errors of instrumental adjustment, including errors in the method of attaching the paper to the instrument.
- (B.) Errors of time and date in the trace.
- (C.) Errors in the method employed in tabulating from these traces.

I.—BAROGRAPH.

(A.) *Errors of adjustment and of attachment of paper.*—It is unnecessary here to consider the subject of *temperature adjustment*, as from a report lately presented to the Meteorological Committee it will be seen that the amount of error due to imperfect temperature compensation is probably very small for all the observatories of the Meteorological Committee. It ought, however, to be noticed occasionally at Kew that the various temperature bars work freely.

Want of definition arising from an improper adjustment of the lens ought here to be noticed, but it is believed that the definition is good in the case of all the observatories. As the instrumental constants for all the various barographs have now been determined, it would hardly seem expedient to alter the position of the lens, which would alter these constants, for the purpose of procuring greater perfection in the matter of definition. It has been remarked by Dr. Robinson that at times of violent and rapid barometric fluctuation the definition is not so good, and in such cases it ought to be recorded that the standard barometer is heaving.

The photographic sheet which is attached to the cylinder of the barograph ought to be evenly put on without any *bagging* or *bulging*, as if it bulged, besides giving a bad result, it might come into contact with the end of the temperature adjustment bar.

Finally, under this head care ought to be taken that there is no *want of light*, especially in the case of a low barometer.

Whenever *finger marks*, *bad photography*, &c., occur special notice ought to be taken of them.

(B.) *Errors of time and date.*—Suppose that the sheet has been placed in an unexceptionable manner upon the barograph cylinder, the next point is for the operator to set the instrumental clock before starting to correct Greenwich mean time, as given by his chronometer. Now the instrumental clock has an arrangement for cutting off the light for four minutes every two hours, beginning to do so two minutes before an even hour and ending two minutes after it, and the practice is for the observer to read the standard barometer about five times every day at periods two minutes after even hours, as ascertained by his chronometer, or when the light should be about to be restored after having been cut off by the clock stop. If therefore the instrumental clock keeps good time and its stop acts, and if the observer reads the standard barometer correctly and at the proper moment as ascertained by his chronometer, and if he finally reduces his curves properly, the near coincidence between the corresponding curve and standard readings will be a good practical test, not only that all these operations have been properly performed, but also that throughout the curve the instrumental clock keeps good time with the chronometer. A further check with regard to time is afforded by the comparison made between the chronometer and the instrumental clock at the moment when the curve is taken off the cylinder, the results of which are recorded on the curve.

The clock may sometimes possibly stop, or the clock stop may go wrong. Without discussing minutely these possibilities it may be sufficient to state that when any such misadventure occurs the curve ought to be inspected by the director of the central observatory.

There still remains the question of *date*. The security that a curve is rightly dated depends ultimately on the strong improbability that an observer at any of the observatories should make a mistake with regard to the first day of the week. When therefore he returns the barograph journal filled up, we may be quite certain that the observations entered on the line with Sunday were really made on that day, although he may possibly put the wrong day of the month on the form beside it.

Again, the photographic operator when he takes off a curve, should mark on the back in pencil the day of the week and month when the curve was taken off, and should also, after drying, write upon its face the hour and day of putting on and taking off as recorded by the journal. If, therefore, the accuracy of the observer in assigning the proper day of the month to Sunday be checked at Kew as each week's journals are transmitted to that establishment, and if it also be seen that the date written in pencil on the back of the curve corresponds to that written on its face, and if the times of starting and ending of the curve as described in front are found to agree with the curve itself as measured by a simple time scale, there can hardly be any doubt that the curve has been properly dated; if there still remain any doubt it will be dispelled when the tabulations from that curve are examined and it is found that the tabulated readings agree well with the simultaneous readings of the standard barometer.

(C.) *Errors in tabulating.*—It will in the first place be necessary to discuss some arrangement for ensuring the entry under the *proper date* into the tabulation forms of the measurements from each curve, for even supposing that by the method now described we can ensure the proper dating of the curve, yet the tabulations from this curve may be entered under the wrong date in the tabulation form.

The appropriate check would seem to be the independent entry from the journal of the standard readings reduced. For if either of these two independent entries be wrongly made this will be seen by a non-coincidence of the reduced readings when compared with the simultaneous standard readings. Our security becomes, therefore, the security which we have that these two independent readings cannot both be erroneously made, and this may be converted into a certainty if the assistant at the central observatory sees that the journal readings are entered under their proper dates into the barograph tabulation forms.

Having thus ascertained the entry into the tabulation forms under their proper dates of the tabulations and of the reduced standard readings, we come next to inquire what check there is for *accuracy of tabulations*; and here we may consider separately the cases of large and small errors.

To begin with *large errors*. The tabulating instrument which will, it is hoped, by the beginning of next year be supplied to all the observatories, is intended to read off at once the curve in terms of barometric height to the thousandth of an inch. But in tabulating with this instrument it is possible to make an error of one or more tenths, or of five hundredths of an inch, in reading off.

The method of overcoming such large errors is by the use of a subsidiary tabulating instrument, consisting of an ivory scale, by which the reading (which is obtained to one thousandth of an inch in the more accurate tabulating instrument) is only obtained to one hundredth of an inch. The readings are independently made by this ivory scale and entered into another sheet of paper, and the readings already made by the ordinary instrument, taken to the nearest hundredth, are copied into the other sheet alongside of the ivory scale readings; finally the differences between the two sets are taken. It is proposed that each of the observatories shall make such tabulations by both instruments, and fill up such a table of differences as that given above, but it is considered desirable that each observatory, having made these two independent tabulations, should not attempt to correct any discrepancy thereby revealed in the return which is sent to Kew, but leave this to be done at the central observatory. They ought, however, to mark every difference in the column A—B exceeding two hundredths of an inch. When the subsidiary measurements reach Kew, the assistant should run his eye over the columns A, B, and A—B, in order to see that the latter is correct and correctly marked. All the differences marked ought to be then examined and their cause ascertained; if due to an error in tabulation this error ought at once to be corrected.

Having by this means obtained correct tabulations, the next point is to check the accuracy with which the *residual correction* has been obtained and applied. And first, with regard to the method by which it is obtained, the practice at Kew has been to calculate it for each day separately. Dr. Miller has raised the question whether it ought not to be calculated for each curve separately. These two methods have both been tried for the Kew Barograms for October 1868, with the following result. The mean difference between the standard and barograph readings was, for the daily residual correction, '0015, while for the other system it was '0022. This, perhaps, proves that the *daily system* is the more correct; and until the question be settled by further experiments to be made at Kew, we may suppose

that this correction is calculated for each day.* The accuracy of this calculation ought to be checked, and such a check may be devised out of the practice pursued at Kew, of taking the mean monthly difference between simultaneous readings of the standard and barograph readings corrected. If these differences are taken for each day apart, each difference with its appropriate sign, then the residual correction may be presumed to be correct, when for that day there are as many *minus* as *plus* differences. Also, when any such difference exceeds, say, $\cdot 005$ of an inch the accuracy with which the standard readings have been reduced to 32° ought in that case to be examined. When a standard reading is evidently wrong it ought to be noted as such on the curve, and should not be made use of either in calculating the residual correction or the monthly mean difference between standard and barograph readings. By applying both the above tests any error in the calculation of the residual correction will be detected and ought to be remedied at once. Having by this means obtained an accurately calculated residual correction, the accuracy with which this is applied to the various hours ought to be tested by the method proposed by Dr. Miller, that is to say, the Kew assistant obscuring from his view the column which embodies the values after the residual correction has been applied should independently apply it on a separate piece of paper, thus producing a new column of corrected pressure, which ought to be compared with the old one; any error discovered by this comparison should be corrected at once. Before leaving this subject it ought to be noted that the tabulating instrument as well as the subsidiary ivory scale are so arranged as always to ensure reading the proper point of the curve for every odd hour.

Should any portion of the curve be too *faint* for measurement with the ordinary tabulating instrument, but not too faint for measurement with the ivory scale, it ought not to be measured at the outlying observatory, but at Kew; it might there be measured by means of the ivory scale, applying to the measurement so obtained a small instrumental correction due to the difference in construction of the two scales, and applying afterwards the residual correction in the usual way. Such readings ought to be specially noted in the tabulation forms.

Should any part of the curve be *deficient from want of light, or any other cause*, it ought not to be inked in at the outlying observatory, and when sent to Kew it ought to be brought personally before the director of the central observatory. If the deficiency be in the border of the temperature curve it will be possible to correct it, but if it be on the barometric curve this cannot be done.

All curves in which the *clock has stopped or the clock stop has been out of action*, should be personally inspected by the director of the central observatory, in order that he may ascertain if the tabulations have been properly made.

Finally, it is right to state that the accuracy of the method of checking the tabulated values now described has been practically confirmed by the month of October at Kew being independently measured by two observers. The results of the two sets when compared together are found on the whole to differ very slightly from one another, the greatest difference being $\cdot 008$ in., which may be supposed to denote a difference in each of $\cdot 004$ on either side of the truth. This extreme difference only occurs three times in the course of the month, that is to say, in 744 observations.

The method of subsidiary tabulations now described is thus proved to be effective in discovering the larger errors that the observer is liable to make when he measures the curve. But to ensure an efficient standard of correctness, it is not only necessary that the larger errors should be altogether eliminated, but *smaller errors* should be reduced to a minimum. Thus an observer might be sufficiently cautious in reading his scale to make no large error, yet sufficiently incautious to read erroneously when he came to the third figure of decimals. For rough results such an observer might be reckoned a good one, but for the more delicate class of investigations his figures would be of less value.

The only way of perfectly eliminating this class of errors is for two independent observers to make separate measurements, each with a tabulating instrument, a course involving much additional labour and expense. But it is obvious that the standard barometer affords a ready approximate means of estimating the correctness of an observer's results. For should he be an incautious observer, the mean difference between the simultaneous readings of the standard and the barograph barometer will be comparatively great, but if he both observe his standard and measure his curves well the mean difference will be small.

But while the simultaneous readings of the standard and barograph barometer afford us one means of testing the correctness of the observer's measurements, they do not yet do quite enough. For in the first place these simultaneous differences may be caused in part by an instrumental error, and in the next place an observer may unconsciously bestow a greater amount of pains upon those measurements which are simultaneous with standard readings than he does upon his other measurements, and the above differences might not therefore be a true representative of his general correctness. A certain number of measurements of the curves of each observatory should consequently be made at the central observatory, and the monthly mean difference between these and the corresponding measurements by the local observer be recorded.

The following regulations for the Barograph are suggested:—

REGULATIONS FOR BAROGRAPH.

Outlying Observatory.

- (1.) The curves, journals, and tabulation forms to be written upon according to pattern furnished.
- (2.) Always begin a new month with new forms. The curves and forms are to be numbered consecutively from the beginning of the year, as will be seen from the diary.
- (3.) Clock to be set to Greenwich Mean Time at starting, and its error not to exceed two minutes in two days.

* As there are generally few observations on Sunday the residual correction used for that day ought to be the mean of those on Saturday and Monday.

† The patterns adopted are very similar to those hitherto made use of by the Falmouth observer.

- (4.) The Barograph-Thermometer and the Standard-Barometer, and its attached Thermometer, ought to be read five times a day if possible while the light is cut off by the clock-arrangement. The light remains cut off by this arrangement for four minutes, and it is necessary to read the Standard Barometer *at the end* of this interval—the exact points in the curve corresponding to certain known readings of the Standard may thus be determined.
- (5.) The instrument should always be started between 10 and 11 a.m. Greenwich Mean Time on those days mentioned in the diary.
- (6.) Every change made in the instrument, every stoppage of clock, &c., and all peculiarities in the curve, noticed by the observer, should be inserted in the journal under the head of "Remarks," with the exact time attached thereto. Should the height of the Barometer cistern be altered, or any change made which will affect the curve, this ought, as already mentioned, to be noticed; it is, however, considered that all such changes ought to be avoided.
- (7.) The previous week's curves, journals, and tabulations should be sent to Kew every Thursday, as mentioned in the diary.

Central Observatory (Assistant).

- (8.) The assistant at Kew shall examine each curve in order to see if there is any want of light or appearance of bagging, or of finger marks, or of bad photography.
- (9.) He shall see that the clock and clock-stop have been in good action for the time of the curve.
- (10.) That the instrumental clock does not differ more than two minutes from the chronometer as recorded on the curve.
- (11.) That the date written on the back of the curve agrees with that on the face.
- (12.) That the curve is properly written upon after the pattern.
- (13.) That in the barograph journal the proper day of the month is placed alongside of Sunday, and that the others follow consecutively.
- (14.) That the times of starting and stopping the curve as recorded in the journal have been properly recorded on the face of the curve.
- (15.) Finally, he shall ascertain, by means of a simple inspection of the curve, that the beginning and ending, as shown by the curve itself, are the same as those described on the face of the curve.
- (16.) He shall see that the journal readings of the standard barometer are entered under their proper dates into the barograph tabulation sheets.
- (17.) Then examine in a general manner the accordance of the barograph and standard readings for each day. If these two tests be satisfactory he may conclude that the tabulations and standard readings have both been entered under their proper dates.
- (18.) Check the accuracy of the subtractions made in the tables of subsidiary measurements furnished by the outlying observatory.
- (19.) Investigate the cause of all cases where $A - B$ is greater than $\cdot 02$ in.; if an error be revealed in the tabulations, this error ought to be corrected at once. These corrections ought to be made before the next step in the process is commenced.
- (20.) Then ascertain the correctness with which the residual correction has been found according to the method described, and whenever it has been necessary to alter the residual correction, a correction should also be made in the last column of the tabulation papers.
- (21.) Then check after the manner described the accuracy with which the residual correction has been applied, producing a new column of corrected pressure, which he shall compare with the old one, and any error discovered by this comparison shall be corrected at once.
- (22.) Portions of the curve too faint for the ordinary instrument, but capable of being measured by the ivory scale shall be measured, corrected, and marked as specified.

Central Observatory (Director).

- (23.) The assistant at Kew shall bring all curves and tabulations which exhibit deficiencies personally before the director of the central observatory, and the latter shall make the necessary remarks on the curves and tabulations, or cause them to be made, and he shall communicate all causes of failure to the Meteorological Committee on the one hand, and to the director of the observatory where the failure occurred on the other, making any remark that may tend in his estimation to obviate in future the cause of failure.
- (24.) He shall also communicate as above the monthly mean differences between the barograph readings reduced, and the simultaneous standard readings.
- (25.) He shall also communicate as above the result of 40 remeasurements for each observatory for each month, to be made at Kew, noting (1) the greatest difference, (2) the mean difference irrespective of sign, (3) the residual difference (if any), taking signs into account.

II.—THERMOGRAPH.

(A.) *Errors of adjustment and of attachment of paper.*—We may have, as in the barograph, *want of definition*, but it is believed that the definition is good in the case of all the observatories; therefore, just as in the case of the barograph, it would hardly seem expedient to alter the position of the lens.

Also, as in the barograph, *bagging* or *bulging* of the paper ought to be avoided.

All *finger marks* on the curve ought to be avoided.

It should also be noticed that there is sufficient *light* to illuminate the whole range of the curve in a proper manner. In order to ensure this, and at the same time procure the best possible definition, the heights of the thermometers may, as occasion requires, and without detriment to the instrument, be altered so as to bring the mean temperature of the time into a central position with respect to the lens and light. This change ought, however, to be made as seldom as possible, perhaps twice or thrice in

a year, and when made, great care ought to be taken that there is no strain upon the wet-bulb thermometer, through tightness of the thread, whether arising from frost or any other cause.

The *wet-bulb arrangements* are particularly liable to go wrong. The attention of the observers is drawn to this subject in the Thermograph regulations, it need not therefore be here discussed.

(B.) *Errors of time and date.*—These are precisely the same as have been already described in the case of the barograph.

(C.) *Errors in tabulating.*—The arrangement proposed for ensuring the entry under the *proper date* into the tabulation forms of the measurements of the thermograph curves, and of the standard readings corrected, is almost precisely the same as that stated in the case of the barograph.

Having ascertained the entry into the tabulation forms under their proper dates of the tabulations, and of the standard readings corrected, we come in the next place to consider the check upon *accuracy of tabulation*, and here as in case of the barograph it will be necessary to consider separately large and small errors.

In the first place with respect to *large errors* in a report lately presented to the Meteorological Committee, it was stated as improbable that a large error of one or more degrees made in reading from the tabulating instrument would pass unnoticed, because if the tabulator be reading the scale in a wrong manner, he will carry on his wrong readings until the first observation hour, when they will at once be discovered by reference to the standard.

This statement is probably correct; nevertheless, even if the assistant who reads from the tabulating instrument make no error which can elude his detection, his fellow assistant who writes down the readings may do so erroneously. The Kew thermograph curves for the month of October have been twice tabulated by independent observers, and in comparing together the results it is found that an error of 10° has been made for three consecutive hours, probably by the assistant who wrote down the readings made by the tabulator. Although an error of this kind may be subsequently detected, yet in order to prevent entirely its occurrence, it is necessary to resort to the system of subsidiary tabulations. An instrument for this purpose is being devised at Kew. It is unnecessary here to state its principle of construction; suffice it to say that the results furnished by it are to be used in the same manner as in the case of the barograph ivory scale already mentioned. By this means correct columns of tabulated readings may be obtained. Again, with regard to the *standard readings*, all that appears to be necessary is to examine both the accuracy of entry of the standard reading corrected, and the accuracy of tabulation for all those cases in which the recorded thermograph temperature is more than half a degree different from the corresponding standard reading, and to make any correction that may be found to be necessary. When a standard reading is evidently wrong it ought to be noted as such on the curve, and should not be made use of in calculating the monthly mean difference between standard and thermograph readings. Before leaving this subject, it ought to be noted that the tabulating instrument as well as the subsidiary scale are both so arranged as to ensure reading the proper point of the curve for every odd hour.

Should any portion of the curves be *deficient from want of light, bad action of wet bulbs, or any other cause*, nothing ought to be done with it at the outlying observatory except to mark in pencil above that portion which appears defective; and when sent to Kew, such curves ought to be brought before the director of the central observatory. Should the observer have tabulated an erroneous reading, this ought to be rejected.

All the dry bulb readings ought to be compared with the corresponding wet bulb ones, and should the latter ever appear higher than the former, the case ought to be marked.

The *maximum* and *minimum* temperatures furnished by the outlying observatories ought to be checked.

All *large errors* may, it is hoped, be completely obviated by the means now described.

With regard to *small errors*, it is proposed to adopt the same plan as that for the barograph, viz.:—

1. To record the monthly mean difference between the simultaneous standard and thermograph readings.
2. To make 40 remeasurements from each month's curves at Kew, recording, as in the case of the barograph, (1) the greatest difference; (2) the mean difference irrespective of sign; (3) the residual difference, if any, taking signs into account.

Finally, it ought to be noted that in tabulating from the thermograph curves, the tabulating instrument should, as suggested by Professor Thomson of Aberdeen, be set from those observation hours where there is little thermometric fluctuation.

REGULATIONS FOR THERMOGRAPH.

Outlying Observatory.

- (1.) The curves, journals, and tabulation forms to be written upon according to pattern furnished.
- (2.) Always begin a new month with new forms. The curves and forms are to be numbered consecutively from the beginning of the year, as will be seen from the diary.
- (3.) Clock to be set to Greenwich Mean Time at starting, and its error not to exceed two minutes in two days.
- (4.) The Standard-thermometers should be read at least five times a day at those moments when the light is cut off by the clock-arrangement. The light remains cut off by this arrangement for four minutes, and it is necessary to read the Standard-thermometers *at the beginning* of this interval; the exact points in the curves corresponding to certain known readings of the Standards may thus be determined. When the Standards are read the observer ought to notice if both wet bulbs are acting properly. If both are right, the sign $\checkmark$ should be made after the recorded temperature of the Wet Standard. If the Thermograph wet-bulb is wrong, the sign t should be made, and if the Standard wet-bulb is wrong, the sign s . Either wet-bulb, if found wrong, ought to be put right at once.

Should it happen that the wet-bulbs are frozen at the moment of observation, the present temperature being also below 32° , cold water should be poured over the wet-bulbs and the connecting strings. In a few minutes the wet-bulbs will by this means be covered with a fresh coating of ice; this should be repeated if necessary. If this operation is performed two or three times a day during very cold weather, there is reason to believe that the wet-bulb will always be covered with a sufficient coating of ice. But if the wet-bulb and the water of the water vessel be frozen from previous cold, the present temperature being above 32° , the ice of the water vessel may be thawed by warm water, using no more than is necessary for the purpose.

If these regulations be followed during the cold months of the year, it is believed that there are comparatively few instances where we may not know the temperature of evaporation during frost.

During dry weather the wet-bulb arrangement is again liable to go wrong, although from a different cause. The thread which in the arrangement adopted lies along a copper groove gets dry in its passage from the water vessel to the bulb, the capillary action ceasing. Sometimes it rights itself without aid, but sometimes it continues wrong until it is put right at the next observation hour. The commencement and termination of such a wrong state of the wet-bulb are generally so clearly indicated by the curve itself, that there appears to be little or no uncertainty in ascertaining what observations ought to be rejected. This action would best appear to be prevented by the use of an india-rubber tube lying along the metallic groove,* and having one end dipping into the water of the water vessel; and through this tube the thread ought to be carried in its passage from the water vessel to the thermometer. Evaporation is thus avoided, and the arrangement will probably answer in winter. When the supply of water is too rapid, it may be easily and safely altered by turning up the tube.

Even when the action of the wet bulb is unexceptionable, water must frequently be added to the water vessel. It is usual for this water to have the temperature of the air, but in cases of a great difference between the two bulbs this will be much above the temperature of evaporation; the consequence is found to be that in such cases there is a rise in the wet bulb curve which in extreme cases may not completely right itself until a quarter of an hour has elapsed. This can only be remedied by each observatory doing all in its power to ensure that under such circumstances the water supplied to the water vessel shall represent as nearly as possible the temperature of the wet bulb at that moment, and also that the supply of water from the water vessel to the wet bulb shall be no greater than is necessary to keep the bulb thoroughly damp without dripping.

- (5.) The instrument should always be started between 10 and 11 a.m. Greenwich Mean Time, on those days mentioned in the diary.
- (6.) Every change made in the instrument, every stoppage of clock, &c., and all peculiarities in the curve noticed by the observer, should be inserted in the Journal under the head of "Remarks," with the exact time attached thereto.
- (7.) The muslin and connecting threads ought to be taken off the bulbs, washed, and replaced as often as they become soiled.
- (8.) The previous week's curves, journals, and tabulations should be sent to Kew every Thursday, as mentioned in the diary.

Central Observatory (Assistant).

- (9.) The assistant shall examine each curve in order to see if there is any want of light, bagging, finger marks, bad photography, or defective action of wet bulb during however short a space of time.
- (10.) He shall see that the clock and clock-stop have been in good action for the time of the curve.
- (11.) That the instrumental clock does not differ more than two minutes from the chronometer as recorded on the curve.
- (12.) That the date written on the back of the curve agrees with that in front.
- (13.) That the curve is properly written upon after the pattern adopted.
- (14.) That in the thermograph journal the proper day of the month is placed alongside of Sunday, and that the others follow consecutively.
- (15.) That the times of starting and stopping the curve as recorded in the journal have been properly recorded on the face of the curve.
- (16.) He shall ascertain, by means of a simple inspection, that the beginning and ending, as shown by the curve itself, are the same as those described in front of the curve.
- (17.) That the journal readings of the standard thermometer are entered under their proper dates into the thermograph tabulation sheets;
- (18.) He shall examine in a general manner the accordance of the thermograph and standard readings for each day. If these two tests be satisfactory, he may conclude that the tabulations and standard readings have both been entered under their proper dates;
- (19.) Check the accuracy of the subtractions made in the tables of the subsidiary measurements;
- (20.) Investigate all cases in which $A - B$ is greater than $0^{\circ}5$ Fah.; and if an error is revealed, it ought to be corrected at once;
- (21.) Examine both the corrected standard reading and the corresponding tabulated one for all those cases in which there is a difference greater than $0^{\circ}5$ between the two;
- (22.) Compare the dry bulb readings with the corresponding wet ones, marking and examining all those cases in which the latter appear higher than the former;
- (23.) Check the accuracy of the maximum and minimum temperatures furnished by the outlying observatories;

* Suggested first at Stonyhurst.

- (24.) Record the monthly mean differences between the simultaneous standard and thermograph readings;
 (25.) Make 40 remeasurements as specified.

Central Observatory (Director).

- (26.) The assistant at Kew shall bring before the director of the central observatory all curves, with their corresponding tabulations, that are deficient from any cause, and the director shall make the necessary remarks on the curves and tabulations, or cause them to be made, and shall communicate all cases of failure to the Meteorological Committee on the one hand, and to the director of the observatory where the failure occurred on the other, making any remarks that may tend in his estimation to obviate in future the causes of failure.
 (27.) The director of the central observatory shall also communicate as above the monthly mean differences between the simultaneous thermograph and standard readings, as well as the result of the 40 remeasurements made at Kew.

III.—ANEMOGRAPH.

(A.) *Errors of adjustment and of attachment of paper.*—It ought to be noticed that both the direction and the velocity pencils are working well and freely on the paper.

It is also to be noticed that for all the observatories except Falmouth the needle on the cylinder goes through the centre of the crosses marked on the metallic paper.

In Falmouth the velocity pencil is slightly out in position, and in consequence that observatory has been directed to set to a point which is not quite in the centre of the crosses. The Falmouth instrument has also been oriented for this position of setting. A note of the proper position of setting for Falmouth is preserved at Kew, and the assistant there ought to inspect each Falmouth anemogram to see that it has been properly set.

(B.) *Errors of time and date.*—Each curve when taken off the cylinder should have both the day of the week and of the month written upon it, and when it reaches Kew it ought to be inspected by the assistant there in order to see that the observer has attached the proper day of the month alongside the day of the week.

He should also see that the week's curves sent are dated consecutively.

With regard to time, a prick made in the small time scale of the metallic sheet denotes in terms of the hour lines ruled on this sheet, the moment of starting, and a similar prick that of taking off. These pricks ought to denote the true chronometer times of starting and taking off very nearly, if the instrumental clock has been properly regulated. All stoppages of the instrumental clock ought to be marked.

It ought also to be noticed that the cylinder is well clamped, otherwise the friction of the pencil upon the cylinder may occasionally overcome that of the clamp, in which case the cylinder will slip.

(C.) *Errors of tabulation.*—The assistant at Kew ought in the first place to ascertain that the curve is tabulated under its proper date. Probably an intelligent inspection of the direction and velocity records in connection with the tabulated results will be sufficient to determine this point.

A simple system of subsidiary tabulations ought to be adopted in order to check the direction results. The observer at the outlying observatory ought to write down on a separate sheet in numbers the direction of the wind at each hour as read by his eye, and compare it as in the case of the barograph and thermograph with the tabulated results. The differences between the two columns or A—B ought to be inspected at Kew, and when they are greater than two points the case ought to be examined, and any error detected ought to be corrected at once. With respect to direction fractional parts of a point ought not to be recorded.

With regard to velocity traces, the action of the instrument is such as to give by a glance at a curve the whole space travelled over by the wind for that day. Perhaps, therefore, it will be a sufficient check upon the velocity records if, in addition to an intelligent comparison of the traces and tabulations, each day's results are added up and the sum total compared with that derived by glancing at the curve. These additions ought to be made at the outlying observatory. When the difference between these two daily sum totals is greater than one-twentieth of the whole, the tabulated velocities for that day ought to be gone over again, and if any error is detected it ought to be put right at once. Should a correction for friction be adopted, the accuracy with which this is applied should be checked in a general manner at Kew.

It is probably unnecessary to check the recorded oscillations, as these are of inferior scientific value, and additional labour bestowed upon them would appear to be superfluous.

Finally, in order to keep a check upon small errors, the system of making at Kew 40 remeasurements for each month, both for direction and velocity ought to be adopted.

REGULATIONS FOR ANEMOGRAPH.

Outlying Observatory.

- (1.) The curves and tabulation forms to be written upon according to the patterns furnished.
- (2.) Always begin a new month with new tabulation forms. The curves and forms are to be numbered consecutively from the beginning of the year, as will be seen from the diary.
- (3.) The pricks on the curve, when compared with the Greenwich mean times of commencement and taking off, ought to agree with the latter within five minutes at each end.
- (4.) The curve should be taken off at 10h. 30m. a.m., and a new one replaced if possible at 10h. 32m. Greenwich mean time.

- (5.) Every change made in the instrument, every stoppage of clock, &c., and all peculiarities in the curve noticed by the observer, should be recorded on the blank part of the sheet of metallic paper, with the exact time attached thereto.
- (6.) The previous week's curves and tabulations should be sent to Kew every Thursday, as recorded in the diary.

Central Observatory (Assistant).

- (7.) The assistant at Kew shall examine each curve in order to see if both pencils work well and freely, and if the paper has been accurately attached to the cylinder, and if the cylinder has not slipped.
- (8.) He shall see that the clock has been in good order during the time of the curve ;
- (9.) That the curve is properly written upon after the pattern adopted ;
- (10.) That in the writing upon the curve the proper day of the month is placed alongside the day of the week ;
- (11.) That the times of putting on and taking off as recorded by the pricker do not differ more than five minutes from the chronometer time.
- (12.) He shall inspect the direction and velocity curves in connexion with the tabulated results, in order to ascertain that each curve is tabulated under its proper date ;
- (13.) Check the accuracy of the subtractions made in the tables of the subsidiary direction measurements ;
- (14.) Examine all cases in which $A - B$ is greater than *two points*, and if an error is revealed it ought to be corrected at once ;
- (15.) Check the accuracy of the velocity tabulations, according to the method herein indicated ;
- (16.) Make 40 remeasurements for each month, both for direction and velocity, as in the case of the other instruments.

Central Observatory (Director).

- (17.) The assistant at Kew shall bring before the director of the central observatory all curves, with their corresponding tabulations, that are deficient from any cause, and the director shall make the necessary remarks on the curves and tabulations, or cause them to be made, and shall communicate all cases of failure to the Meteorological Committee on the one hand, and to the director of the observatory where the failure occurred on the other, making any remarks that may tend in his estimation to obviate in future the causes of failure.
- (18.) The director of the central observatory shall also communicate as above the result of the 48 remeasurements made at Kew.

A diary of operations is appended to this report, and a scheme for recording in a tabulated form the various shortcomings of the observatories noticed when each week's returns are examined at Kew.

DIARY OF OPERATIONS FOR 1869.

JANUARY.

Day of Month.	Day of Week.	No. of Bar. and Ther. Sheets taken off this day.	No. of Anem. Sheet taken off this day.	No. of Journals and Tabulations ending this day.	Send to Kew				REMARKS.
					Bar. and Ther. Curves, Nos. inclusive.	Anem. Curves, Nos. inclusive.	Journals and Tabulations, Nos.	Weather Report for	
1	Frid. -	1	1						
2	Sat. -		2	1					
3	Sun. -	2-3	3						
4	Mon. -		4						
5	Tues. -	4-5	5						
6	Wed. -		6						
7	Thur. -	6-7	7		1 to 3	1 to 3	1		
8	Frid. -		8						
9	Sat. -	8-9	9	2					
10	Sun. -		10						
11	Mon. -	10-11	11						
12	Tues. -		12						
13	Wed. -	12-13	13						
14	Thur. -		14		4 to 11	4 to 10	2		
15	Frid. -	14-15	15						
16	Sat. -		16	3					
17	Sun. -	16-17	17						{ Kew to send in document for December 1868 to the Central Office.
18	Mon. -		18						
19	Tues. -	18-19	19						
20	Wed. -		20						
21	Thur. -	20-21	21		12 to 17	11 to 17	3		
22	Frid. -		22						
23	Sat. -	22-23	23	4					
24	Sun. -		24						
25	Mon. -	24-25	25						
26	Tues. -		26						
27	Wed. -	26-27	27						
28	Thur. -		28		18 to 25	18 to 24	4		
29	Frid. -	28-29	29						
30	Sat. -		30	5					
31	Sun. -	30-31	31	6					

FEBRUARY.

Day of Month.	Day of Week.	No. of Bar. and Ther. Sheets taken off this day.	No. of Anem. Sheet taken off this day.	No. of Journals and Tabulations ending this day.	Send to Kew				REMARKS.
					Bar. and Ther. Curves, Nos. inclusive.	Anem. Curves, Nos. inclusive.	Journals and Tabulations, Nos.	Weather Report for	
1	Mon. -		32						
2	Tues. -	32-33	33						
3	Wed. -		34						
4	Thur. -	34-35	35		26 to 31	25 to 31	5		
5	Frid. -		36						
6	Sat. -	36-37	37	7					
7	Sun. -		38						
8	Mon. -	38-39	39						
9	Tues. -		40						
10	Wed. -	40-41	41						
11	Thur. -		42		32 to 39	32 to 38	6 and 7	January	
12	Frid. -	42-43	43						
13	Sat. -		44	8					
14	Sun. -	44-45	45						
15	Mon. -		46						
16	Tues. -	46-47	47						
17	Wed. -		48						
18	Thur. -	48-49	49		40 to 45	39 to 45	8		
19	Frid. -		50						
20	Sat. -	50-51	51	9					
21	Sun. -		52						
22	Mon. -	52-53	53						{ Kew to send in January documents to the Central Office.
23	Tues. -		54						
24	Wed. -	54-55	55						
25	Thur. -		56		46 to 53	46 to 52	9		
26	Frid. -	56-57	57						
27	Sat. -		58	10					
28	Sun. -	58-59	59	11					

MARCH.

Day of Month.	Day of Week.	No. of Bar. and Ther. Sheets taken off this day.	No. of Anem. Sheet taken off this day.	No. of Journals and Tabulations ending this day.	Send to Kew				REMARKS.
					Bar. and Ther. Curves, Nos. inclusive.	Anem. Curves, Nos. inclusive.	Journals and Tabulations, Nos.	Weather Report for	
1	Mon. -		60						
2	Tues. -	60-61	61						
3	Wed. -		62						
4	Thur. -	62-63	63		54 to 59	53 to 59	10		
5	Frid. -		64						
6	Sat. -	64-65	65	12					
7	Sun. -		66						
8	Mon. -	66-67	67						
9	Tues. -		68						
10	Wed. -	68-69	69						
11	Thur. -		70		60 to 67	60 to 66	11 & 12	February	
12	Frid. -	70-71	71						
13	Sat. -		72	13					
14	Sun. -	72-73	73						
15	Mon. -		74						
16	Tues. -	74-75	75						
17	Wed. -		76						
18	Thur. -	76-77	77		68 to 73	67 to 73	13		
19	Frid. -		78						
20	Sat. -	78-79	79	14					
21	Sun. -		80						
22	Mon. -	80-81	81						{ Kew to send in the February documents to the Central Office.
23	Tues. -		82						
24	Wed. -	82-83	83						
25	Thur. -		84		74 to 81	74 to 80	14		
26	Frid. -	84-85	85						
27	Sat. -		86	15					
28	Sun. -	86-87	87						
29	Mon. -		88						
30	Tues. -	88-89	89						
31	Wed. -		90	16					

APRIL.

Day of Month.	Day of Week.	No. of Bar. and Ther. Sheets taken off this day.	No. of Anem. Sheet taken off this day.	No. of Journals and Tabulations ending this day.	Send to Kew				REMARKS.
					Bar. and Ther. Curves, Nos. inclusive.	Anem. Curves, Nos. inclusive.	Journals and Tabulations, Nos.	Weather Report for	
1	Thur. -	90-91	91	17	82 to 87	81 to 87	15	March	{ Kew to send in March documents to the Central Office.
2	Frid. -		92						
3	Sat. -	92-93	93						
4	Sun. -		94						
5	Mon. -	94-95	95						
6	Tues. -		96	18	88 to 95	88 to 94	16 & 17		
7	Wed. -	96-97	97						
8	Thur. -		98						
9	Frid. -	98-99	99						
10	Sat. -		100						
11	Sun. -	100-101	101	19	96 to 101	95 to 101	18		
12	Mon. -		102						
13	Tues. -	102-103	103						
14	Wed. -		104						
15	Thur. -	104-105	105						
16	Frid. -		106	20	102 to 109	102 to 108	19		
17	Sat. -	106-107	107						
18	Sun. -		108						
19	Mon. -	108-109	109						
20	Tues. -		110						
21	Wed. -	110-111	111	21	110 to 115	109 to 115	20		
22	Thur. -		112						
23	Frid. -	112-113	113						
24	Sat. -		114						
25	Sun. -	114-115	115						
26	Mon. -		116						
27	Tues. -	116-117	117						
28	Wed. -		118						
29	Thur. -	118-119	119						
30	Frid. -		120						

MAY.

Day of Month.	Day of Week.	No. of Bar. and Ther. Sheets taken off this day.	No. of Anem. Sheet taken off this day.	No. of Journals and Tabulations ending this day.	Send to Kew				REMARKS.
					Bar. and Ther. Curves, Nos. inclusive.	Anem. Curves, Nos. inclusive.	Journals and Tabulations, Nos.	Weather Report for	
1	Sat. -	120-121	121	22					
2	Sun. -		122						
3	Mon. -	122-123	123						
4	Tues. -		124						
5	Wed. -	124-125	125						
6	Thur. -		126		116 to 123	116 to 122	21 & 22	April	
7	Frid. -	126-127	127						
8	Sat. -		128	23					
9	Sun. -	128-129	129						
10	Mon. -		130						
11	Tues. -	130-131	131						
12	Wed. -		132						
13	Thur. -	132-133	133		124 to 129	123 to 129	23		
14	Frid. -		134						
15	Sat. -	134-135	135	24					
16	Sun. -		136						
17	Mon. -	136-137	137						{ Kew to send in April documents to the Central Office
18	Tues. -		138						
19	Wed. -	138-139	139						
20	Thur. -		140		130 to 137	130 to 136	24		
21	Frid. -	140-141	141						
22	Sat. -		142	25					
23	Sun. -	142-143	143						
24	Mon. -		144						
25	Tues. -	144-145	145						
26	Wed. -		146						
27	Thur. -	146-147	147		138 to 143	137 to 143	25		
28	Frid. -		148						
29	Sat. -	148-149	149	26					
30	Sun. -		150						
31	Mon. -	150-151	151	27					

JUNE.

Day of Month.	Day of Week.	No. of Bar. and Ther. Sheets taken off this day.	No. of Anem. Sheet taken off this day.	No. of Journals and Tabulations ending this day.	Send to Kew				REMARKS.
					Bar. and Ther. Curves, Nos. inclusive.	Anem. Curves, Nos. inclusive.	Journals and Tabulations, Nos.	Weather Report for	
1	Tues. -		152						
2	Wed. -	152-153	153						
3	Thur. -		154		144 to 151	144 to 150	26		
4	Frid. -	154-155	155						
5	Sat. -		156	28					
6	Sun. -	156-157	157						
7	Mon. -		158						
8	Tues. -	158-159	159						
9	Wed. -		160						
10	Thur. -	160-161	161		152 to 157	151 to 157	27 & 28	May	
11	Frid. -		162						
12	Sat. -	162-163	163	29					
13	Sun. -		164						
14	Mon. -	164-165	165						
15	Tues. -		166						
16	Wed. -	166-167	167						
17	Thur. -		168		158 to 165	158 to 164	29		
18	Frid. -	168-169	169						
19	Sat. -		170	30					
20	Sun. -	170-171	171						{ Kew to send in May documents to the Central Office.
21	Mon. -		172						
22	Tues. -	172-173	173						
23	Wed. -		174						
24	Thur. -	174-175	175		166 to 171	165 to 171	30		
25	Frid. -		176						
26	Sat. -	176-177	177	31					
27	Sun. -		178						
28	Mon. -	178-179	179						
29	Tues. -		180						
30	Wed. -	180-181	181	32					

JULY.

Day of Month.	Day of Week.	No. of Bar. and Ther. Sheets taken off this day.	No. of Anem. Sheet taken off this day.	No. of Journals and Tabulations ending this day.	Send to Kew				REMARKS.
					Bar. and Ther. Curves, Nos. inclusive.	Anem. Curves, Nos. inclusive.	Journals and Tabulations, Nos.	Weather Report for	
1	Thur. -		182		172 to 179	172 to 178	31		
2	Frid. -	182-183	183						
3	Sat. -		184	33					
4	Sun. -	184-185	185						
5	Mon. -		186						
6	Tues. -	186-187	187						
7	Wed. -		188						
8	Thur. -	188-189	189		180 to 185	179 to 185	32 & 33	June	
9	Frid. -		190						
10	Sat. -	190-191	191	34					
11	Sun. -		192						
12	Mon. -	192-193	193						
13	Tues. -		194						
14	Wed. -	194-195	195						
15	Thur. -		196		186 to 193	186 to 192	34		
16	Frid. -	196-197	197						
17	Sat. -		198	35					
18	Sun. -	198-199	199						
19	Mon. -		200						{ Kew to send in June documents to the Central Office.
20	Tues. -	200-201	201						
21	Wed. -		202						
22	Thur. -	202-203	203		194 to 199	193 to 199	35		
23	Frid. -		204						
24	Sat. -	204-205	205	36					
25	Sun. -		206						
26	Mon. -	206-207	207						
27	Tues. -		208						
28	Wed. -	208-209	209						
29	Thur. -		210		200 to 207	200 to 206	36		
30	Frid. -	210-211	211						
31	Sat. -		212	37					

AUGUST.

Day of Month.	Day of Week.	No. of Bar. and Ther. Sheets taken off this day.	No. of Anem. Sheet taken off this day.	No. of Journals and Tabulations ending this day.	Send to Kew				REMARKS.
					Bar. and Ther. Curves, Nos. inclusive.	Anem. Curves, Nos. inclusive.	Journals and Tabulations, Nos.	Weather Report for	
1	Sun. -	212-213	213						
2	Mon. -		214						
3	Tues. -	214-215	215						
4	Wed. -		216						
5	Thur. -	216-217	217		208 to 213	207 to 213	37		
6	Frid. -		218						
7	Sat. -	218-219	219	38					
8	Sun. -		220						
9	Mon. -	220-221	221						
10	Tues. -		222						
11	Wed. -	222-223	223						
12	Thur. -		224		214 to 221	214 to 220	38	July	
13	Frid. -	224-225	225						
14	Sat. -		226	39					
15	Sun. -	226-227	227						
16	Mon. -		228						{ Kew to send in July documents to Central Office.
17	Tues. -	228-229	229						
18	Wed. -		230						
19	Thur. -	230-231	231		222 to 227	221 to 227	39		
20	Frid. -		232						
21	Sat. -	232-233	233	40					
22	Sun. -		234						
23	Mon. -	234-235	235						
24	Tues. -		236						
25	Wed. -	236-237	237						
26	Thur. -		238		228 to 235	228 to 234	40		
27	Frid. -	238-239	239						
28	Sat. -		240	41					
29	Sun. -	240-241	241						
30	Mon. -		242						
31	Tues. -	242-243	243	42					

SEPTEMBER.

Day of Month.	Day of Week.	No. of Bar. and Ther. Sheets taken off this day.	No. of Anem. Sheet taken off this day.	No. of Journals and Tabulations ending this day.	Send to Kew				REMARKS.
					Bar. and Ther. Curves, Nos. inclusive.	Anem. Curves, Nos. inclusive.	Journals and Tabulations, Nos.	Weather Report for	
1	Wed. -		244						
2	Thur. -	244-245	245		236 to 241	235 to 241	41		
3	Frid. -		246						
4	Sat. -	246-247	247	43					
5	Sun. -		248						
6	Mon. -	248-249	249						
7	Tues. -		250						
8	Wed. -	250-251	251						
9	Thur. -		252		242 to 249	242 to 248	42 & 43	August	
10	Frid. -	252-253	253						
11	Sat. -		254	44					
12	Sun. -	254-255	255						
13	Mon. -		256						
14	Tues. -	256-257	257						
15	Wed. -		258						
16	Thur. -	253-259	259		250 to 255	249 to 255	44		
17	Frid. -		260						
18	Sat. -	260-261	261	45					
19	Sun. -		262						
20	Mon. -	262-263	263						{ Kew to send August documents to the Central Office
21	Tues. -		264						
22	Wed. -	264-265	265						
23	Thur. -		266		256 to 263	256 to 262	45		
24	Frid. -	266-267	267						
25	Sat. -		268	46					
26	Sun. -	268-269	269						
27	Mon. -		270						
28	Tues. -	270-271	271						
29	Wed. -		272						
30	Thur. -	272-273	273	47	264 to 269	263 to 269	46		

OCTOBER.

Day of Month.	Day of Week.	No. of Bar. and Ther. Sheets taken off this day.	No. of Anem. Sheet taken off this day.	No. of Journals and Tabulations ending this day.	Send to Kew				REMARKS.
					Bar. and Ther. Curves, Nos. inclusive.	Anem. Curves, Nos. inclusive.	Journals and Tabulations, Nos.	Weather Report for	
1	Frid. -		274						
2	Sat. -	274-275	275	48					
3	Sun. -		276						
4	Mon. -	276-277	277						
5	Tues. -		278						
6	Wed. -	278-279	279						
7	Thur. -		280		270 to 277	270 to 276	47 & 48	Sept.	
8	Frid. -	280-281	281						
9	Sat. -		282	49					
0	Sun. -	282-283	283						
1	Mon. -		284						
2	Tues. -	284-285	285						
3	Wed. -		286						
4	Thur. -	286-287	287		278 to 283	277 to 283	49		
5	Frid. -		288						
6	Sat. -	288-289	289	50					
7	Sun. -		290						
8	Mon. -	290-291	291						{ Kew to send in September documents to Central Office.
9	Tues. -		292						
0	Wed. -	292-293	293						
1	Thur. -		294		284 to 291	284 to 290	50		
2	Frid. -	294-295	295						
3	Sat. -		296	51					
4	Sun. -	296-297	297						
5	Mon. -		298						
6	Tues. -	298-299	299						
7	Wed. -		300						
8	Thur. -	300-301	301		292 to 297	291 to 297	51		
9	Frid. -		302						
0	Sat. -	302-303	303	52					
1	Sun. -		304	53					

to send
its to that

NOVEMBER.

Day of Month.	Day of Week.	No. of Bar. and Ther. Sheets taken off this day.	No. of Anem. Sheet taken off this day.	No. of Journals and Tabulations ending this day.	Send to Kew				REMARKS.
					Bar. and Ther. Curves, Nos. inclusive.	Anem. Curves, Nos. inclusive.	Journals and Tabulations, Nos.	Weather Report for	
1	Mon. -	304-305	305						
2	Tues. -		306						
3	Wed. -	306-307	307						
4	Thur. -		308		298 to 305	298 to 304	52		
5	Frid. -	308-309	309						
6	Sat. -		310	54					
7	Sun. -	310-311	311						
8	Mon. -		312						
9	Tues. -	312-313	313						
10	Wed. -		314						
11	Thur. -	314-315	315		306 to 311	305 to 311	53 & 54	October	
12	Frid. -		316						
13	Sat. -	316-317	317	55					
14	Sun. -		318						
15	Mon. -	318-319	319						
16	Tues. -		320						
17	Wed. -	320-321	321						
18	Thur. -		322		312 to 319	312 to 318	55		
19	Frid. -	322-323	323						
20	Sat. -		324	56					
21	Sun. -	324-325	325						
22	Mon. -		326						{ Kew to send in October documents to the Captains Office.
23	Tues. -	326-327	327						
24	Wed. -		328						
25	Thur. -	328-329	329		320 to 325	319 to 325	56		
26	Frid. -		330						
27	Sat. -	330-331	331	57					
28	Sun. -		332						
29	Mon. -	332-333	333						
30	Tues. -		334	58					

DECEMBER.

Day of Month.	Day of Week.	No. of Bar. and Ther. Sheets taken off this day.	No. of Anem. Sheet taken off this day.	No. of Journals and Tabulations ending this day.	Send to Kew				REMARKS.
					Bar. and Ther. Curves, Nos. inclusive.	Anem. Curves, Nos. inclusive.	Journals and Tabulations, Nos.	Weather Report for	
1	Wed. -	334-335	335						
2	Thur. -		336		326 to 333	326 to 332	57		
3	Frid. -	336-337	337						
4	Sat. -		338	59					
5	Sun. -	338-339	339						
6	Mon. -		340						
7	Tues. -	340-341	341						
8	Wed. -		342						
9	Thur. -	342-343	343		334 to 339	333 to 339	58 & 59	Nov.	
10	Frid. -		344						
11	Sat. -	344-345	345	60					
12	Sun. -		346						
13	Mon. -	346-347	347						
14	Tues. -		348						
15	Wed. -	348-349	349						
16	Thur. -		350		340 to 347	340 to 346	60		
17	Frid. -	350-351	351						
18	Sat. -		352	61					
19	Sun. -	352-353	353						
20	Mon. -		354						{ Kew to send in November documents to the Central Office.
21	Tues. -	354-355	355						
22	Wed. -		356						
23	Thur. -	356-357	357		348 to 353	347 to 353	61		
24	Frid. -		358						
25	Sat. -	358-359	359	62					
26	Sun. -		360						
27	Mon. -	360-361	361						
28	Tues. -		362						
29	Wed. -	362-363	363						
30	Thur. -		364		354 to 361	354 to 360	62		
31	Frid. -	364-365	365	63					

I.

BAROGRAMS, &c.

(Received at Kew, _____.)

Points noticed at Kew.	Results and Remarks.
1. Deficiency in number of documents sent	
2. Errors in numbering and writing upon them - - -	
(A.) Want of light in curves - -	
(B.) Bagging in do. - -	
C.) Finger marks, &c., in do. - -	
3. Action of clock - - -	
4. Regulation of do. - - -	
(D.) Action of clock stop - - -	
5. Errors in dating curves - -	
(E.) Do. in entry or date of entry of journal readings of standard into tabulation sheets - - -	
6. Do. in date of entry of tabulated readings into tabulation sheets -	
7. Do. of subtraction in subsidiary tables	
8. Do. of tabulation discovered by subsidiary tables - - -	
(c.) Do. in calculating residual correction -	
(d.) Do. in applying residual correction -	
9. Ten remeasurements.	
(1.) Greatest difference - -	
(2.) Mean difference irrespective of sign - - -	
(3.) Residual difference - -	

II.

THERMOGRAMS, &c.

(Received at Kew, .)

Points noticed at Kew.	Results and Remarks.
1. Deficiency in number of documents sent	
2. Errors in numbering and writing upon them - - - -	
(A.) Want of light in curves - -	
(B.) Bagging in do. - -	
(C.) Finger marks, &c., in do. - -	
(a.) Defective action of wet bulb -	
3. Action of clock - - -	
4. Regulation of do. - -	
(D.) Action of clock stop - - -	
5. Errors in dating curves - -	
(E.) Do. in entry or date of entry of journal readings of standard into tabulation sheets - - -	
6. Do. in date of entry of tabulated readings into tabulation sheets -	
7. Do. of subtraction in subsidiary tables	
8. Do. of tabulation discovered by subsidiary tables - - -	
(b.) Do. in maxima and minima - -	
9. Ten remeasurements.	
(1.) Greatest difference - -	
(2.) Mean difference irrespective of sign - - - -	
(3.) Residual difference - -	

III.

ANEMOGRAMS, &c.

(Received at Kew, .)

Points noticed at Kew.	Results and Remarks.
1. Deficiency in number of documents sent	
2. Errors in numbering and writing upon them - - - -	
(e.) Action of pencils - - -	
(f.) Errors of attachment of paper -	
(g.) Slipping of cylinder - - -	
3. Action of clock - - -	
4. Regulation of do. - - -	
5. Errors in dating curves - -	
6. Do. in date of entry of tabulated readings into tabulation sheets -	
7. Do. of subtraction in subsidiary tables	
8. Do. in direction discovered by subsidiary tables - - -	
(h.) Do. in velocity discovered by subsidiary arrangement - - -	
9 (a.) Ten remeasurements (direction).	
(1.) Greatest difference - -	
(2.) Mean difference irrespective of sign - - -	
(3.) Residual difference - -	
9 (b.) Ten remeasurements (velocity).	
(1.) Greatest difference - -	
(2.) Mean difference irrespective of sign - - -	
(3.) Residual difference - -	

The Secretary presented the following description of the Kew Observatory, in order to complete the accounts in the minutes of the various observatories of the Meteorological Committee :—

KEW OBSERVATORY.

The Kew Observatory, latitude $51^{\circ} 28' 6''$ N., longitude $0^{\circ} 18' 47''$ W., is situated in the Old Deer Park, Richmond, Surrey, a level and somewhat low-lying tract of pasture land bordered on one side by the river Thames, the proximity of which causes the locality to be damp and subject to frequent fogs.

The ground around the building is somewhat elevated above the general level of the park, and the building itself is freely exposed on all sides, the nearest obstacles to the free action of the wind being three trees placed 60 yards to the S.E. of the building, the tops of which are a little lower than the cups of the anemometer. A belt of trees extends along the river bank, but the nearest point of approach is 300 yards distant. The country round is generally wooded.

The *Anemograph* is placed on iron girders well above the dome of the observatory, the shafts being carried diagonally into the photographic room to the north of the dome. It was oriented with reference to the position of the observatory, which stands north and south. The pencils are right and the instrument works well.

The *Barograph* is erected in the basement of the observatory in the same room with the self-recording magnetographs. The standard barometer to which it is referred is in the ground floor of the east wing of the building, and the height of its cistern is 34 feet above the mean sea level at Liverpool. The diameter of the tube of the standard barometer is 0.550 in., while that of the barograph barometer is 0.500 in.

The *Thermograph* is placed on the north side of the west wing of the observatory, the thermometer bulbs being 10 feet above the surface of the ground. The frame is freely exposed. A slight projection of the building 10 feet distant from the frame shields it from the early morning sun, and a light Venetian boarded screen has been placed three feet to the west of the frame, to ward off the afternoon sun.

The *rain gauge* is placed on the surface, one foot above the ground, on the lawn attached to the observatory, the aperture of the funnel being 100 square inches. The rain gauge is read at 10 a.m., and the rain which falls between 10 a.m. of one day and 10 a.m. of the next day is entered as having fallen on the first of those two days.

The following cheques were drawn :—

For Salaries for December :

	£	s.	d.
R. H. Scott	-	-	66 13 4
H. Toynbee	-	-	33 6 8
B. Stewart	-	-	33 6 8
W. Salmon	-	-	17 10 0
J. S. Harding, junior	-	-	13 6 8
R. Strachan	-	-	*15 16 8
F. Gaster	-	-	9 3 4
C. Harding	-	-	8 6 8
R. H. Curtis	-	-	6 19 2
J. S. Harding, senior	-	-	†7 10 0
F. Steventon	-	-	6 13 4

Allowances to Observatories :

D. Thomson, Aberdeen	-	-	62 10 0
T. R. Robinson, Armagh (2)	-	-	28 15 0
W. P. Dymond, Falmouth	-	-	62 10 0
R. Grant, Glasgow	-	-	62 10 0
B. Stewart, Kew	-	-	£62 10 0
Assistance „	-	-	30 0 0

92 10 0

S. J. Perry, Stonyhurst	-	-	50 0 0
T. Kerr, Valencia	-	-	20 16 8

Accounts, &c. :

J. J. Hicks, Instruments	-	-	17 14 4
Magnetic Telegraph Company, November	-	-	54 2 9
Submarine „ „ „	-	-	32 18 7
J. S. Harding, junior, Office Expenses	-	-	15 0 0
F. Gaster, Gratuity	-	-	10 0 0

£727 19 10

* Including allowance for care of Instruments.

† For five weeks to 31st December.

The Committee then adjourned.